

## 10Gb/s XFP 1310nm 10km Transceiver DC-DX9231-LRx

### Features

- Up to 11.3Gb/s data links
- 1310nm DFB transmitter and PIN receiver
- Up to 10km on 9/125μm SMF
- Hot-pluggable XFP footprint
- Duplex LC/UPC optical connector
- RoHS-10 compliant and lead-free
- Single +3.3V power supply
- No Reference Clock required
- Maximum power consumption 1.8W
- Support Digital Monitoring interface
- Metal enclosure, for lower EMI
- Meet ESD requirements, resist 8KV direct contact voltage
- Case operating temperature
  - Commercial: 0 ~ +70°C
  - Extended: -10 ~ +80°C
  - Industrial: -40 ~ +85°C



### Applications

- 10GBASE-LR/LW & 10G Ethernet
- 10G Fiber Channel
- Other Optical Links

## Part Number Ordering Information

Part Number	Data Rate (Gb/s)	Wavelength (nm)	Transmission Distance(km)	Temperature (°C) (Operating Case)
DC-DX9231-LRC	10.3125	1310	10	0~70 commercial
DC-DX9231-LRE	10.3125	1310	10	-10~80 Extended
DC-DX9231-LRI	10.3125	1310	10	-40~85 Industrial

## I. Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit	Notes
Storage Temperature	T <sub>s</sub>	-40	85	°C	
Power Supply Voltage	V <sub>CC</sub>	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	5	95	%	
Damage Threshold	TH <sub>d</sub>	5		dBm	

## II. Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T <sub>OP</sub>	0		70	°C	commercial
		-10		80		extended
		-40		85		Industrial
Power Supply Voltage	V <sub>CC</sub>	3.135	3.3	3.465	V	
Data Rate			10.3125		Gb/s	
Control Input Voltage High		2		V <sub>CC</sub>	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			10	km	9/125um

### III. General Description

Do-networks' DC-DX9231-LRx XFP transceiver is designed for use in 10-Gigabit Ethernet links up to 10km over single mode fiber. The module consists of DFB Laser, PIN and Preamplifier in a high-integrated optical sub-assembly. Digital diagnostics functions are available via a 2-wire serial interface, as specified in XFP MSA.

DC-DX9231-LRx transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, and received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The XFP MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.

### IV. Pin Assignment and Pin Description

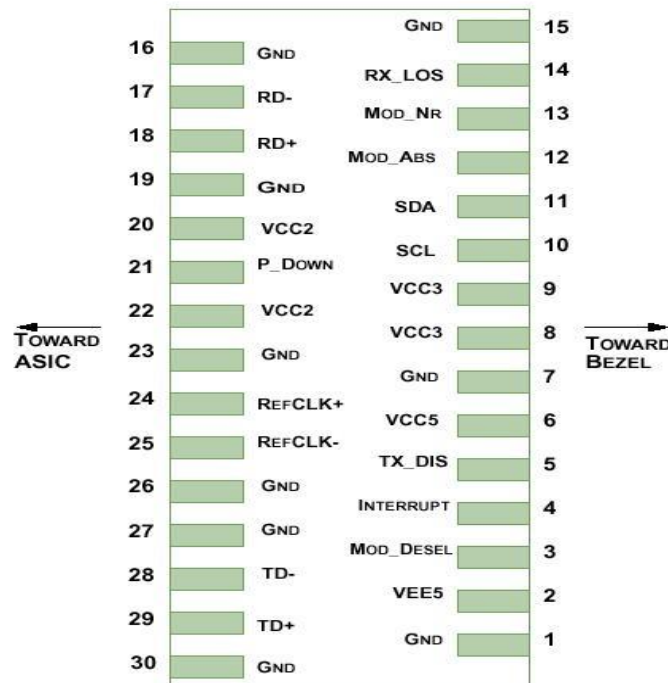


Figure1. Diagram of host board connector block pin numbers and names

Pin	Symbol	Name/Description	Notes
1	GND	Module Ground	1
2	VEE5	Optional –5.2 Power Supply – Not required	
3	Mod-Desel	Module De-select; When held low allows the module to respond to 2-wire serial interface commands	
4	Interrupt	Interrupt (bar); Indicates presence of an important condition which can be read over the serial 2-wire interface	2
5	TX_DIS	Transmitter Disable; Transmitter laser source turned off	
6	VCC5	+5 Power Supply – Not required	
7	GND	Module Ground	1
8	VCC3	+3.3V Power Supply	
9	VCC3	+3.3V Power Supply	
10	SCL	Serial 2-wire interface clock	
11	SDA	Serial 2-wire interface data line	2
12	Mod_Abs	Module Absent; Indicates module is not present. Grounded in the module.	2
13	Mod_NR	Module Not Ready; Do-networks's defines it as a logical OR between RX_LOS and Loss of Lock in TX/RX.	2
14	RX_LOS	Receiver Loss of Signal indicator	2
15	GND	Module Ground	1
16	GND	Module Ground	1
17	RD-	Receiver inverted data output	
18	RD+	Receiver non-inverted data output	
19	GND	Module Ground	1
20	VCC2	+1.8V Power Supply – Not required	
21	P_Down/RST	Power Down; When high, places the module in the low power stand-by mode and on the falling edge of P_Down initiates a module reset	
		Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle.	
22	VCC2	+1.8V Power Supply – Not required	

23	GND	Module Ground	1
24	RefCLK+	Reference Clock non-inverted input, AC coupled on the host board – Not required	3
25	RefCLK-	Reference Clock inverted input, AC coupled on the host board – Not required	3
26	GND	Module Ground	1
27	GND	Module Ground	1
28	TD-	Transmitter inverted data input	
29	TD+	Transmitter non-inverted data input	
30	GND	Module Ground	1

Notes:

1. Module circuit ground is isolated from module chassis ground within the module.
2. Open collector; should be pulled up with 4.7kΩ-10kΩ on host board to a voltage between 3.15V and 3.6V.
3. A Reference Clock input is not required by the DC-DX9231-LRx. If present, it will be ignored.

## V. Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Power Consumption	p			1.8	W	1
Supply Current	I <sub>cc</sub>			520	mA	
<b>Transmitter</b>						
Single-ended Input Voltage Tolerance	V <sub>cc</sub>	-0.3		4.0	V	
AC Common Mode Input Voltage Tolerance (RMS)		15			mV	
Differential Input Voltage Swing	V <sub>in,pp</sub>	120		820	mV <sub>pp</sub>	
Differential Input Impedance	Z <sub>in</sub>	90	100	110	Ohm	2
Transmit Disable Assert Time				10	us	
Transmit Disable Voltage	V <sub>dis</sub>	V <sub>cc</sub> -1.3		V <sub>cc</sub>	V	3

Transmit Enable Voltage	Ven	Vee		Vee +0.8	V	
<b>Receiver</b>						
Differential Output Voltage Swing	Vout,pp	350		850	mVpp	
Differential Output Impedance	Zout	90	100	110	Ohm	4
Data output rise/fall time	Tr/Tf	28			ps	5
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	6
LOS De-assert Voltage	VlosL	Vee		Vee +0.8	V	6
Power Supply Rejection	PSR	100			mVpp	7

Notes:

1. Maximum total power value is specified across the full temperature and voltage range.
2. After internal AC coupling.
3. Or open circuit.
4. In to 100 ohms differential termination.
5. These are unfiltered 20-80% values
6. Loss of Signal is open collector to be pulled up with a 4.7kΩ-10kΩ resistor to 3.15-3.6V. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
7. Per Section 2.7.1. in the XFP MSA Specification1.

## VI. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
<b>Transmitter</b>						
Center Wavelength	$\lambda$	1290	1310	1330	nm	1
Optical Spectral Width	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Power	P <sub>AVG</sub>	-6		-1	dBm	
Optical Extinction Ratio	ER	3.5			dB	

Transmitter and Dispersion Penalty	TDP			3.2	dB	
Transmitter OFF Output Power	POff			-30	dBm	
Transmitter Eye Mask	Compliant with IEEE802.3ae					
<b>Receiver</b>						
Center Wavelength	$\lambda$	1270		1610	nm	
Receiver Sensitivity (Average Power)	Sen.			-15	dBm	2
Input Saturation Power (overload)	Psat	0.5			dBm	
LOS Assert	LOSA	-32			dBm	
LOS De-assert	LOSD			-18	dBm	
LOS Hysteresis	LOSH	0.5			dB	

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Notes:

1. Average power figures are informative only, per IEEE 802.3ae.
2. Measured with Light source 1310nm, ER=3.5dB; BER =  $<10^{-12}$  @ 10.3125Gbps, PRBS=2<sup>31</sup>-1 NRZ.

## VII. Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	°C	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-0.15	0.15	V	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor	DMI_bias	-10%	10%	mA	

TX power monitor absolute error	DMI_TX	-3	3	dB	
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## VIII. Mechanical Dimensions

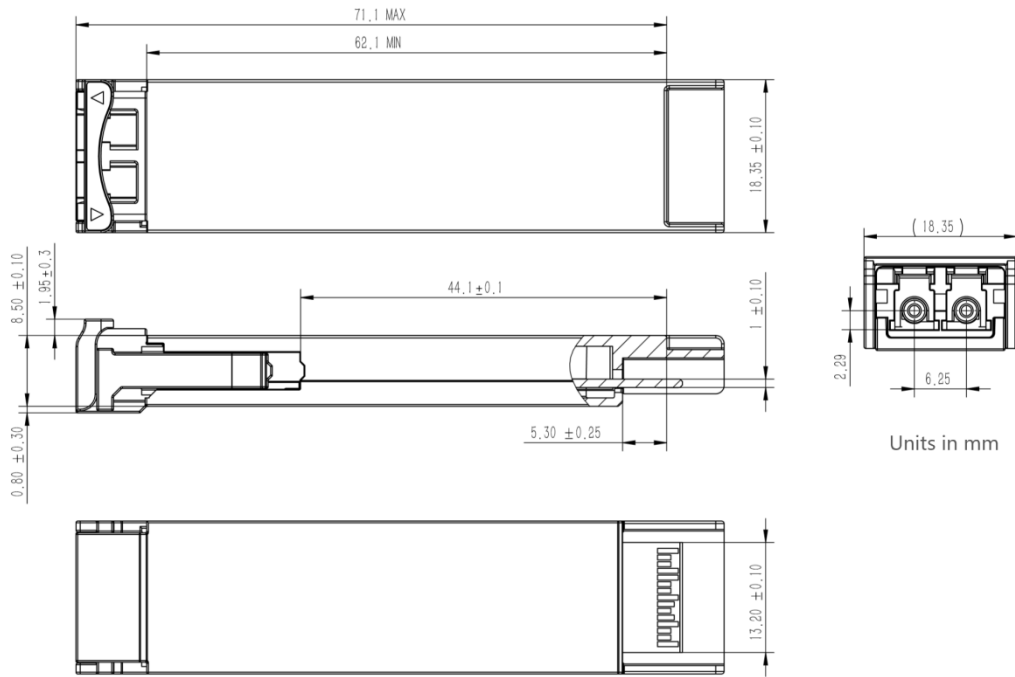


Figure2. Mechanical Outline

## IX. Precautions

- This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.
- Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.





**DC-DX9231-LRx**  
*Product Specification Rev1.1*

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