



### **XFP-5D-21-OPC**

Rad® XFP-5D-21 Compatible TAA 10GBase-DWDM XFP Transceiver 100GHz (SMF, 1560.61nm, 40km, LC, DOM)

#### **Features**

- INF-8077i Compliance
- Duplex LC Connector
- Temperature-stabilized EML transmitter and PIN receiver
- Single-mode Fiber
- Commercial Temperature 0 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free



#### **Applications:**

- 10x Gigabit Ethernet over DWDM
- 8x/10x Fibre Channel
- Access, Metro and Enterprise

#### **Product Description**

This Rad® XFP-5D-21 compatible XFP transceiver provides 10GBase-DWDM throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1560.61nm via an LC connector. It can operate at temperatures between 0 and 70C. Our transceiver is built to meet or exceed OEM specifications and is guaranteed to be 100% compatible with Rad®. It has been programmed, uniquely serialized, and tested for data-traffic and application to ensure that it will initialize and perform identically. All of our transceivers comply with Multi-Source Agreement (MSA) standards to provide seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

OptioConnect's transceivers are RoHS compliant and lead-free.

## Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015.4
- ESD to the LC Receptacle: compatible with IEC 61000-4-3
- EMI/EMC compatible with FCC Part 15 Subpart B Rules, EN55022:2010
- Laser Eye Safety compatible with FDA 21CFR, EN60950-1& EN (IEC) 60825-1,2
- RoHS compliant with EU RoHS 2.0 directive 2015/863/EU

## Wavelength Guide (100GHz ITU-T Channel)

| Channel # | Frequency (THz) | Center Wavelength (nm) |
|-----------|-----------------|------------------------|
| 17        | 191.7           | 1563.86                |
| 18        | 191.8           | 1563.05                |
| 19        | 191.9           | 1562.23                |
| 20        | 192.0           | 1561.42                |
| 21        | 192.1           | 1560.61                |
| 22        | 192.2           | 1559.79                |
| 23        | 192.3           | 1558.98                |
| 24        | 192.4           | 1558.17                |
| 25        | 192.5           | 1557.36                |
| 26        | 192.6           | 1556.55                |
| 27        | 192.7           | 1555.75                |
| 28        | 192.8           | 1554.94                |
| 29        | 192.9           | 1554.13                |
| 30        | 193.0           | 1553.33                |
| 31        | 193.1           | 1552.52                |
| 32        | 193.2           | 1551.72                |
| 33        | 193.3           | 1550.92                |
| 34        | 193.4           | 1550.12                |
| 35        | 193.5           | 1549.32                |
| 36        | 193.6           | 1548.51                |
| 37        | 193.7           | 1547.72                |
| 38        | 193.8           | 1546.92                |
| 39        | 193.9           | 1546.12                |
| 40        | 194.0           | 1545.32                |
| 41        | 194.1           | 1544.53                |
| 42        | 194.2           | 1543.73                |
| 43        | 194.3           | 1542.94                |
| 44        | 194.4           | 1542.14                |

|    |       |         |
|----|-------|---------|
| 45 | 194.5 | 1541.35 |
| 46 | 194.6 | 1540.56 |
| 47 | 194.7 | 1539.77 |
| 48 | 194.8 | 1538.98 |
| 49 | 194.9 | 1538.19 |
| 50 | 195.0 | 1537.40 |
| 51 | 195.1 | 1536.61 |
| 52 | 195.2 | 1535.82 |
| 53 | 195.3 | 1535.04 |
| 54 | 195.4 | 1534.25 |
| 55 | 195.5 | 1533.47 |
| 56 | 195.6 | 1532.68 |
| 57 | 195.7 | 1531.90 |
| 58 | 195.8 | 1531.12 |
| 59 | 195.9 | 1530.33 |
| 60 | 196.0 | 1529.55 |
| 61 | 196.1 | 1528.77 |

#### Absolute Maximum Ratings

| Parameter                  | Symbol | Min. | Max. | Unit |
|----------------------------|--------|------|------|------|
| Maximum Supply Voltage     | Vcc3   | -0.5 | 4.0  | V    |
|                            | Vcc5   | -0.5 | 6.0  | V    |
| Storage Temperature        | TS     | -40  | 85   | °C   |
| Operating Case Temperature | TO     | 0    | 70   | °C   |
| Relative Humidity          | RH     | 5    | 95   | %    |
| Data Rate                  |        | 9.95 | 11.3 | Gb/s |

## Electrical Characteristics

| Parameter                        | Symbol   | Min.        | Typ. | Max.        | Unit     | Notes |
|----------------------------------|----------|-------------|------|-------------|----------|-------|
| Power Supply Voltage             | Vcc3     | 3.135       | 3.3  | 3.465       | V        |       |
|                                  | Vcc5     | 4.75        | 5.00 | 5.25        | V        |       |
| Power Supply Current             | Icc3     |             |      | 750         | mA       |       |
|                                  | Icc5     |             |      | 500         |          |       |
| Power Dissipation                | Pd       |             |      | 3500        | mW       |       |
| Transmitter                      |          |             |      |             |          |       |
| Differential data input swing    | Vin,pp   | 120         |      | 1000        | mVp-p    |       |
| Input differential impedance     | Zin      |             | 100  |             | $\Omega$ |       |
| TX_Disable, P_Down/RST           | VIH      | 2.0         |      | Vcc3+0.3    | V        |       |
|                                  | VIL      | -0.3        |      | 0.8         | V        |       |
| Transmit Disable Assert Time     |          |             |      | 10          | us       |       |
| Receiver                         |          |             |      |             |          |       |
| Differential data output swing   | Vout, pp | 340         |      | 850         | mVp-p    | 1     |
| Output differential impedance    | Zo       |             | 100  |             | $\Omega$ |       |
| Data Output Rise Time, Fall Time | tr, tf   | 24          |      |             | ps       | 2     |
| Rx_LOS, Mod-NR, Interrupt        | VOH      | VccHost-0.5 |      | VccHost+0.3 | V        | 3     |
|                                  | VOL      | 0           |      | 0.4         | V        | 3     |

### Notes:

1. Internally AC coupled, but requires an external 100 $\Omega$  differential termination.
2. 20-80%.
3. Loss of Signal is an open collector output. Should be pulled up with a 4.7k $\Omega$ -10k $\Omega$  resistor on the host board.

## Optical Characteristics

| Parameter                    | Symbol            | Min.    | Typ. | Max.    | Unit | Notes |
|------------------------------|-------------------|---------|------|---------|------|-------|
| Transmitter                  |                   |         |      |         |      |       |
| Launch Average Optical Power | Po                | -1      |      | +4      | dBm  | 1     |
| Center Wavelength Range      | $\lambda_c$       | 1528.77 |      | 1563.86 | nm   |       |
| Center Wavelength Spacing    |                   |         | 100  |         | GHz  |       |
| Center Wavelength Tolerance  | $\Delta\lambda_c$ | -100    |      | 100     | pm   |       |
| Extinction Ratio             | ER                | 9       |      |         | dB   | 2     |
| Spectral Width (-20dB)       | $\Delta\lambda$   |         |      | 0.3     | nm   |       |
| Side Mode Suppression Ratio  | SMSR              | 30      |      |         | dB   |       |

|                                   |                                          |      |  |       |     |   |
|-----------------------------------|------------------------------------------|------|--|-------|-----|---|
| Average Optical Power (Laser Off) | Poff                                     |      |  | -30   | dBm | 1 |
| Eye Diagram                       | ITU-T G.691 SDH STM-64 L-64.2 compatible |      |  |       |     | 2 |
| Receiver                          |                                          |      |  |       |     |   |
| Center Wavelength                 | λc                                       | 1528 |  | 1565  | nm  |   |
| Receiver Sensitivity @ 9.953Gb/s  | S                                        |      |  | -24.0 | dBm | 3 |
| Receiver Sensitivity @ 11.1 Gb/s  | S                                        |      |  | -15   | dBm | 4 |
| Receiver overload (Pavg)          | POL                                      | -1   |  |       | dBm | 3 |
| Path Penalty @1600ps @9.953Gb/s   | PP1                                      |      |  | 2     | dB  | 3 |
| Path Penalty @1600ps @11.1 Gb/s   | PP2                                      |      |  | 3     | dB  | 4 |
| Optical Return Loss               | ORL                                      | 27   |  |       | dB  |   |
| LOS De-Assert                     | LOSD                                     |      |  | -27   | dBm |   |
| LOS Assert                        | LOSA                                     | -38  |  |       | dBm |   |
| LOS Hysteresis                    |                                          | 0.5  |  |       | dB  |   |

**Notes:**

1. Measured with worst ER; 1550nm; PRBS 2<sup>31</sup>-1 test pattern @ 9.953 Gb/s, BER<10<sup>-12</sup>.
2. Measured with worst ER; 1550nm; PRBS 2<sup>31</sup>-1 test pattern @ 11.1 Gb/s, BER<10<sup>-12</sup>.

## Pin Descriptions

| Pin | Logic     | Symbol     | Name/Descriptions                                                                                                                                                                                                                                                                                 | Ref. |
|-----|-----------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1   |           | GND        | Module Ground                                                                                                                                                                                                                                                                                     | 1    |
| 2   |           | Vee5       | Optional -5.2v Power Supply (not required)                                                                                                                                                                                                                                                        |      |
| 3   | LVTTL-I   | MOD_DESEL  | Module De-select; When Held low allows the module to respond to 2-wire serial interface.                                                                                                                                                                                                          |      |
| 4   | LVTTL-O   | INTERRUPT  | Interrupt; Indicates presence of an important condition which can be read via the 2-wire serial interface.                                                                                                                                                                                        | 2    |
| 5   | LVTTL-I   | TX_DIS     | Transmitter Disable; Turns off transmitter laser output                                                                                                                                                                                                                                           |      |
| 6   |           | VCC5       | +5V Power Supply                                                                                                                                                                                                                                                                                  |      |
| 7   |           | GND        | Module Ground                                                                                                                                                                                                                                                                                     | 1    |
| 8   |           | VCC3       | +3.3V Power Supply                                                                                                                                                                                                                                                                                |      |
| 9   |           | VCC3       | +3.3V Power Supply                                                                                                                                                                                                                                                                                |      |
| 10  | LVTTL-I/O | SCL        | 2-Wire Serial Interface Clock.                                                                                                                                                                                                                                                                    | 2    |
| 11  | LVTTL-I/O | SDA        | 2-Wire Serial Interface Data Line.                                                                                                                                                                                                                                                                | 2    |
| 12  | LVTTL-O   | MOD_Abs    | Indicates Module is not present. Grounded in the Module.                                                                                                                                                                                                                                          | 2    |
| 13  | LVTTL-O   | MOD_NR     | Module Not Ready; Indicating Module Operational Fault.                                                                                                                                                                                                                                            | 2    |
| 14  | LVTTL-O   | RX_LOS     | Receiver Loss of Signal Indicator                                                                                                                                                                                                                                                                 | 2    |
| 15  |           | GND        | Module Ground                                                                                                                                                                                                                                                                                     | 1    |
| 16  |           | GND        | Module Ground                                                                                                                                                                                                                                                                                     | 1    |
| 17  | CML-O     | RD-        | Receiver Inverted Data Output                                                                                                                                                                                                                                                                     |      |
| 18  | CML-O     | RD+        | Receiver Non-Inverted Data Output.                                                                                                                                                                                                                                                                |      |
| 19  |           | GND        | Module Ground                                                                                                                                                                                                                                                                                     | 1    |
| 20  |           | VCC2       | +1.8V Power Supply (Not required).                                                                                                                                                                                                                                                                |      |
| 21  | LVTTL-I   | P_DOWN/RST | Power down; When high, requires the module to limit power consumption to 1.5W or below. 2-Wire serial interface must be functional in the low power mode.<br>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  | PECL-I    | 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  | CML-I     | TD-        | Transmitter Inverted Data Input.                                                                                                                                                                                                                                                                  |      |
| 29  | CML-I     | TD+        | Transmitter Non-Inverted Data Input.                                                                                                                                                                                                                                                              |      |
| 30  |           | GND        | Module Ground                                                                                                                                                                                                                                                                                     | 1    |

**Notes:**

1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7KΩ to 10KΩ to a voltage between 3.15V and 3.45V on the host board.
3. Reference Clock is not required. If present, it will be ignored.

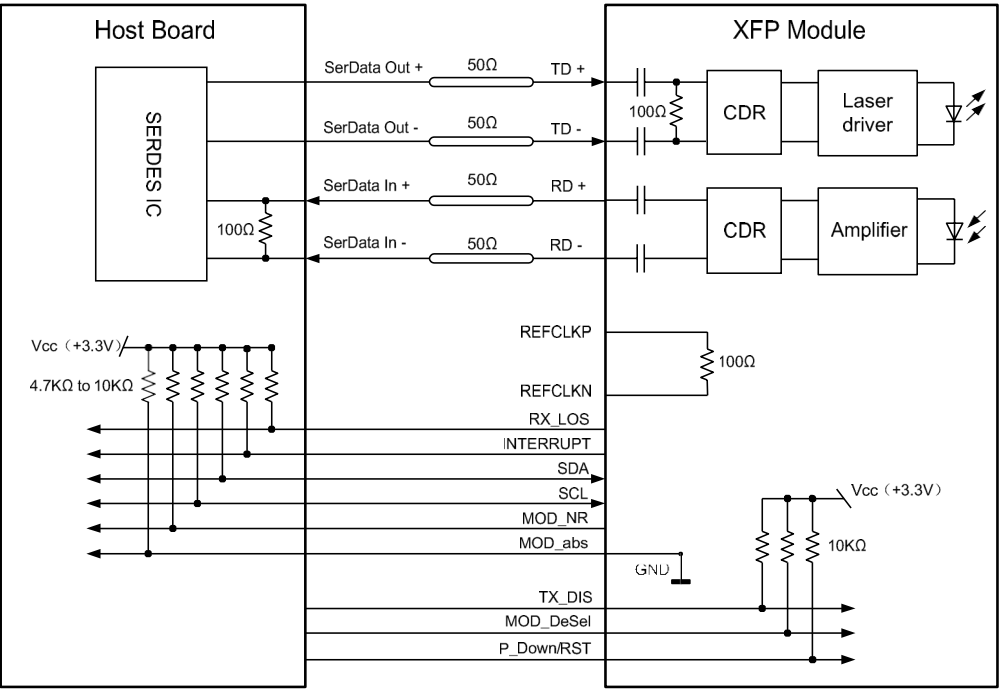


Pin-out of connector Block on Host board

# OSNR Characteristics

| Bit Rate (Gbps)    | Dispersion (ps/nm) | OSNR (dB) | Receiver Sensitivity (dBm) | BER    |
|--------------------|--------------------|-----------|----------------------------|--------|
| 9.95/10.3          | 0                  | >30       | -24 ~ -7                   | 10E-12 |
|                    |                    | >25       | -18 ~ -7                   |        |
|                    | 1200               | >30       | -23 ~ -7                   |        |
|                    |                    | >27       | -18 ~ -7                   |        |
|                    | 1600               | >30       | -22 ~ -7                   |        |
|                    |                    | >28       | -18 ~ -7                   |        |
| 10.7/11.1 with FEC | 0                  | >30       | -26 ~ -7                   | 10E-4  |
|                    |                    | >16       | -18 ~ -7                   |        |
|                    | 1200               | >30       | -25 ~ -7                   |        |
|                    |                    | >18       | -18 ~ -7                   |        |
|                    | 1600               | >30       | -22 ~ -7                   |        |
|                    |                    | >20       | -18 ~ -7                   |        |

# Recommended Application Interface Block Diagram

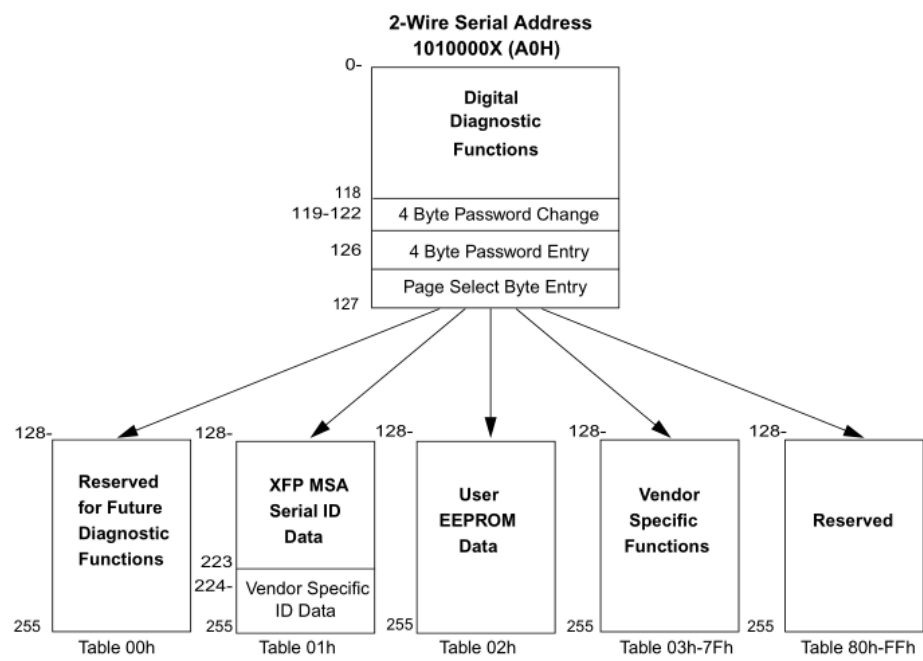




Recommended Host Board Power Supply Filter Network



Management Interface



**Mechanical Specifications**

Small Form Factor Pluggable (XFP) transceivers are compatible with the dimensions defined by the XFP Multi-Sourcing Agreement (MSA).



## **OptioConnect**

### **Innovation for the Future of High-Speed Networking**

#### **Who We Are**

OptioConnect is reshaping the landscape of communication and high-speed networking through intelligent technology. With a core focus on cutting edge technology, we deliver smarter fiber optic solutions for enterprise networks, data centers, and next-gen telecom infrastructures.

#### **What We Do**

At OptioConnect, we fuse advanced engineering with intelligent automation to drive the future of networking. Our AI-integrated solutions are designed to optimize performance and streamline operations with:

- Superior Performance
- Network and traffic optimization
- Intelligent energy management
- Seamless OEM compatibility
- Scalable cost-efficiency

#### **Smarter Networks by Design**

Innovation isn't just a goal—it's our process. We embed AI and machine learning across our R&D and product lines, enabling adaptive performance, automated tuning, and faster deployment cycles. The result? Networks that don't just work—they learn, evolve, and outperform.

#### **Our Team**

Our engineers, data scientists, and network architects bring decades of experience and a future-focused mindset. We provide hands-on support with intelligent insights that turn complex challenges into simple solutions.

#### **Our Mission**

To deliver AI-enhanced connectivity that reduces cost, increases speed, and maximizes efficiency—empowering our partners to operate at the forefront of a rapidly evolving digital world.

#### **Let's Connect**

Discover how OptioConnect's intelligent infrastructure solutions can power your network's next leap forward.

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