

## 21R9931-C

IBM® 21R9931 Compatible TAA Compliant 4GBase-LW Fibre Channel SFP Transceiver (SMF, 1310nm, 10km, LC, DOM)

### Features:

- INF-8074 and SFF-8472 Compliance
- Duplex LC Connector
- Single-mode Fiber
- Commercial Temperature 0 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free



### Applications:

- Fibre Channel
- Access and Enterprise

### Product Description

This IBM® 21R9931 compatible SFP transceiver provides 4GBase-LW Fibre Channel throughput up to 10km over single-mode fiber (SMF) using a wavelength of 1310nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent IBM® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow 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.

ProLabs' transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S. – made or designated country end products."



## Absolute Maximum Ratings

| Parameter              | Symbol | Min. | Max. | Unit |
|------------------------|--------|------|------|------|
| Maximum Supply Voltage | Vcc    | -0.5 | 4.0  | V    |
| Storage Temperature    | TS     | -40  | 85   | °C   |
| Operating Humidity     | RH     | 5    | 95   | %    |

## Recommended Operating Conditions

| Parameter                    | Symbol | Min. | Typ.  | Max. | Unit |
|------------------------------|--------|------|-------|------|------|
| Power Supply Voltage         | Vcc    | 3.13 | 3.30  | 3.47 | V    |
| Power Supply Current         | Icc    |      |       | 250  | mA   |
| Case Operating Temperature   | Tc     | 0    |       | 70   | °C   |
| Data Rate (Gigabit Ethernet) |        |      | 1.25  |      | Gbps |
| Data Rate (Fibre Channel)    |        |      | 1.063 |      | Gbps |
| 9/125µm G.652 SMF            | Lmax   |      |       | 10   | km   |

## Electrical Characteristics (TOP=25°C, Vcc=3.3V)

| Parameter                      | Symbol   | Min.    | Typ. | Max.    | Unit | Notes |
|--------------------------------|----------|---------|------|---------|------|-------|
| Transmitter                    |          |         |      |         |      |       |
| Input differential impedance   | Rin      |         | 100  |         | Ω    | 1     |
| Single ended data input swing  | Vin, pp  | 250     |      | 1200    | mV   |       |
| TX Disable-High                |          | Vcc-1.3 |      | Vcc     | V    |       |
| TX Disable-Low                 |          | Vee     |      | Vee+0.8 | V    |       |
| TX Fault-High                  |          | Vcc-0.5 |      | Vcc     | V    |       |
| TX Fault-Low                   |          | Vee     |      | Vee+0.5 | V    |       |
| Receiver                       |          |         |      |         |      |       |
| Single ended data output swing | Vout, pp | 300     | 400  | 800     | mV   | 2     |
| Data output rise time          | tr       |         |      | 175     | ps   | 3     |
| Data output fall time          | tf       |         |      | 175     | ps   | 3     |
| LOS-High                       |          | Vcc-0.5 |      | Vcc     | V    |       |
| LOS-Low                        |          | Vee     |      | Vee+0.5 | V    |       |

### Notes:

1. AC coupled.
2. Into 100 ohm differential termination.
3. 20% - 80%

## Optical Characteristics

| Parameter                 | Symbol            | Min. | Typ. | Max. | Unit | Notes |
|---------------------------|-------------------|------|------|------|------|-------|
| <b>Transmitter</b>        |                   |      |      |      |      |       |
| Output Opt. Power         | PO                | -9.5 |      | -3   | dBm  | 1     |
| Optical Wavelength        | $\lambda$         | 1275 | 1310 | 1350 | nm   |       |
| Spectral Width            | $\sigma$          |      |      | 3    | nm   |       |
| Optical Rise/Fall Time    | tr/tf             |      |      | 260  | ps   | 2     |
| Total Jitter              | TJ                |      |      | 200  | ps   |       |
| Optical Extinction Ratio  | ER                | 9    |      |      | dB   |       |
| <b>Receiver</b>           |                   |      |      |      |      |       |
| RX Sensitivity @1.25 Gbs  | RSNS              |      |      | -21  | dBm  | 3,4   |
| Maximum Received Power    | RX <sub>MAX</sub> | -3   |      |      | dBm  |       |
| Optical Center Wavelength | $\lambda_C$       | 1270 |      | 1600 | nm   |       |
| LOS De-Assert             | LOSD              |      |      | -22  | dBm  |       |
| LOS Assert                | LOSA              | -42  |      |      | dBm  |       |
| LOS Hysteresis            |                   | 0.5  |      | 5    | dB   |       |

### Notes:

1. Class 1 Laser Safety.
2. Unfiltered, 20%-80%. Complies with GE and 1x FC eye masks when filtered.
3. Measured with conformance signals defined in FC-PI-2 Rev. 10.0 specifications.
4. Measured with PRBS 2<sup>7</sup>-1 at 10<sup>-10</sup> BER.

## Pin Descriptions

| Pin | Symbol      | Name/Descriptions  | Ref. |
|-----|-------------|--|------|
| 1   | VeeT        | Transmitter Ground (Common with Receiver Ground)               | 1    |
| 2   | TX Fault    | Transmitter Fault.   |      |
| 3   | TX Disable  | Transmitter Disable. Laser output disabled on high or open.    | 2    |
| 4   | MOD_DEF (2) | Module Definition 2. Data line for Serial ID.                  | 3    |
| 5   | MOD_DEF (1) | Module Definition 1. Clock line for Serial ID.                 | 3    |
| 6   | MOD_DEF (0) | Module Definition 0. Grounded within the module.               | 3    |
| 7   | Rate Select | No connection required.  |      |
| 8   | LOS         | Loss of Signal indication. Logic 0 indicates normal operation. | 4    |
| 9   | VeeR        | Receiver Ground (Common with Transmitter Ground)               | 1    |
| 10  | VeeR        | Receiver Ground (Common with Transmitter Ground)               | 1    |
| 11  | VeeR        | Receiver Ground (Common with Transmitter Ground)               | 1    |
| 12  | RD-         | Receiver Inverted DATA out. AC Coupled.                        |      |
| 13  | RD+         | Receiver Non-inverted DATA out. AC Coupled.                    |      |
| 14  | VeeR        | Receiver Ground (Common with Transmitter Ground)               | 1    |
| 15  | VccR        | Receiver Power Supply.   |      |
| 16  | VccT        | Transmitter Power Supply.                                      |      |
| 17  | VeeT        | Transmitter Ground (Common with Receiver Ground)               | 1    |
| 18  | TD+         | Transmitter Non-Inverted DATA in. AC Coupled.                  |      |
| 19  | TD-         | Transmitter Inverted DATA in. AC Coupled.                      |      |
| 20  | VeeT        | Transmitter Ground (Common with Receiver Ground)               | 1    |

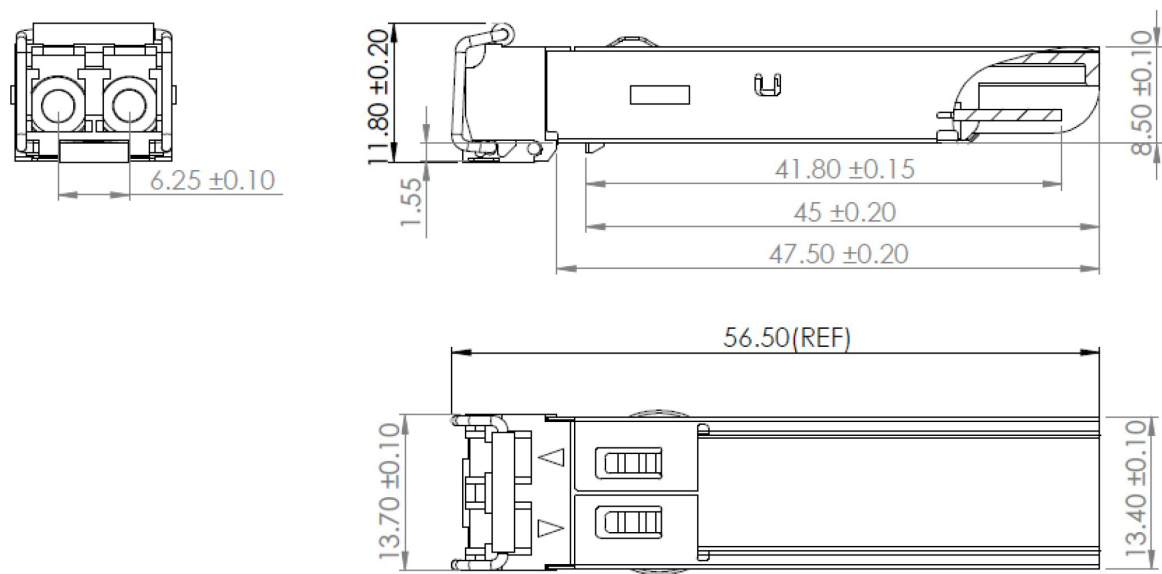
## Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TX Disable >2.0V or open, enabled on TX Disable <0.8V.
3. Should be pulled up with 4.7k-10kohms on host board to a voltage between 2.0V and 3.6V. MOD\_DEF (0) pulls line low to indicate module is plugged in.
4. LOS is open collector output. Should be pulled up with 4.7k-10kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.



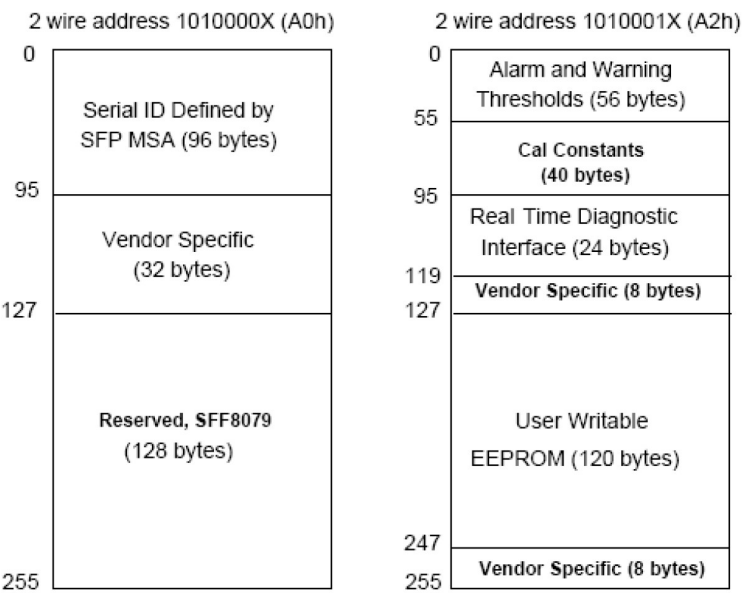
**Mechanical Specifications**

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



**EEPROM Information**

EEPROM memory map specific data field description is as below:



## About ProLabs

Our experience comes as standard; for over 15 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with over 90 optical switching and transport platforms.

## Complete Portfolio of Network Solutions

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 400G while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

## Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure that you get immediate answers to your questions and compatible product when needed. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.



## Contact Information

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