

## NTK591NJ-C

Ciena® NTK591NJ Compatible TAA 1000Base-CWDM SFP Transceiver (SMF, 1510nm, 160km, 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:

- 1000Base-SX Ethernet
- 1x Fibre Channel
- Access, Metro and Enterprise

### Product Description

This Ciena® NTK591NJ compatible SFP transceiver provides 1000Base-CWDM throughput up to 160km over single-mode fiber (SMF) using a wavelength of 1510nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Ciena® 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."



### CWDM Available Wavelengths

| Wavelengths | Min.   | Typ. | Max.   |
|-------------|--------|------|--------|
| 27          | 1264.5 | 1270 | 1277.5 |
| 29          | 1284.5 | 1290 | 1297.5 |
| 31          | 1304.5 | 1310 | 1317.5 |
| 33          | 1324.5 | 1330 | 1337.5 |
| 35          | 1344.5 | 1350 | 1357.5 |
| 37          | 1364.5 | 1370 | 1377.5 |
| 39          | 1384.5 | 1390 | 1397.5 |
| 41          | 1404.5 | 1410 | 1417.5 |
| 43          | 1424.5 | 1430 | 1437.5 |
| 45          | 1444.5 | 1450 | 1457.5 |
| 47          | 1464.5 | 1470 | 1477.5 |
| 49          | 1484.5 | 1490 | 1497.5 |
| 21          | 1504.5 | 1510 | 1517.5 |
| 23          | 1524.5 | 1530 | 1537.5 |
| 55          | 1544.5 | 1550 | 1557.5 |
| 57          | 1564.5 | 1570 | 1577.5 |
| 59          | 1584.5 | 1590 | 1597.5 |
| 61          | 1604.5 | 1610 | 1617.5 |

### Absolute Maximum Ratings

| Parameter                   |     | Symbol | Min. | Typ.  | Max. | Unit | Notes |
|-----------------------------|-----|--------|------|-------|------|------|-------|
| Maximum Supply Voltage      |     | Vcc    | -0.5 |       | 3.6  | V    |       |
| Storage Temperature         |     | Tstg   | -40  |       | 85   | °C   |       |
| Operating Case Temperature  |     | Tc     | 0    |       | 70   | °C   |       |
| Operating Relative Humidity |     | RH     | 5    |       | 85   | %    |       |
| Power Supply Current        |     | Icc    |      |       | 300  | mA   |       |
| Link Budget                 |     |        |      | 3.6   |      | dB   |       |
| Data Rate                   | GBE |        |      | 1.25  |      | Gbps |       |
|                             | FC  |        |      | 1.063 |      |      |       |

## Electrical Characteristics

| Parameter                     |         | Symbol | Min. | Typ. | Max.    | Unit  | Notes |
|-------------------------------|---------|--------|------|------|---------|-------|-------|
| Supply Voltage                |         | Vcc    | 3.15 | 3.3  | 3.45    | V     |       |
| Transmitter                   |         |        |      |      |         |       |       |
| Differential LVPECL Inputs    |         | VIN    | 400  |      | 2000    | mVp-p | 1     |
| Input Differential Impedance  |         | ZIN    | 85   | 100  | 115     | Ω     | 2     |
| Tx_Disable                    | Disable |        | 2    |      | Vcc+0.3 | V     |       |
|                               | Enable  |        | 0    |      | 0.8     | V     |       |
| Tx_Fault                      | Fault   |        | 2    |      | Vcc+0.3 | V     |       |
|                               | Normal  |        | 0    |      | 0.8     |       |       |
| Receiver                      |         |        |      |      |         |       |       |
| Differential LVPECL Outputs   |         | VOUT   | 400  |      | 2000    | mVp-p | 3     |
| Output Differential Impedance |         | ZOUT   | 85   | 100  | 115     | Ω     |       |
| Tx_Disable Assert Time        |         | T_off  |      |      | 10      | us    |       |
| Rx_LOS                        | LOS     |        | 2    |      | Vcc+0.3 | V     |       |
|                               | Normal  |        | 0    |      | 0.8     |       |       |
| MOD_DEF(0.2)                  |         | VOH    | 2.5  |      |         | V     | 4     |
|                               |         | VOL    | 0    |      | 0.5     |       |       |

### Notes:

1. AC coupled inputs. LVPECL logic. Internally AC coupled.
2. R<sub>IN</sub>>100kΩ @DC.
3. AC coupled outputs. LVPECL logic. Internally AC coupled.
4. With serial ID.

## Optical Characteristics

| Parameter                   | Symbol                    | Min.             | Typ.        | Max.             | Unit | Notes |
|-----------------------------|---------------------------|------------------|-------------|------------------|------|-------|
| Transmitter                 |                           |                  |             |                  |      |       |
| Center Wavelength           | $\lambda_C$               | $\lambda_C$ -6.5 | $\lambda_C$ | $\lambda_C$ +6.5 | nm   |       |
| Spectral Width (-20dB)      | $\Delta\lambda$           |                  |             | 1                | nm   |       |
| Average Output Power        | POUT                      | 2                |             | 7                | dBm  | 1     |
| Side-Mode Suppression Ratio | SMSR                      | 30               |             |                  | dB   |       |
| Extinction Ratio            | ER                        | 9                |             |                  | dB   |       |
| Rise/Fall Time (20-80%)     | Tr/Tf                     |                  |             | 0.26             | ns   |       |
| POUT @Tx_Disable Asserted   | POUT                      |                  |             | -45              | dBm  |       |
| Output Optical Eye          | Compliant with IEEE 802.3 |                  |             |                  |      | 2     |
| Receiver                    |                           |                  |             |                  |      |       |
| Center Wavelength           | $\lambda_C$               | 1260             |             | 1630             | nm   |       |
| Receiver Sensitivity        | Pmin                      |                  |             | -34              | dBm  | 3     |
| Receiver Overload           | Pmax                      | -9               |             |                  | dBm  |       |
| LOS De-Assert               | LOSD                      |                  |             | -37              | dBm  |       |
| LOS Assert                  | LOSA                      | -45              |             |                  | dBm  |       |
| LOS Hysteresis              |                           | 0.5              |             |                  | dB   |       |

### Notes:

1. Output power is power coupled into a 9/125 $\mu$ m single-mode fiber.
2. Filtered, measured with a PRBS 2<sup>7</sup>-1 test pattern @1250Mbps.
3. Minimum average optical power is measured at BER less than 1E<sup>-12</sup>, with 1.25Gbps, 2<sup>7</sup>-1 PRBS, and ER=9dB.

## Pin Descriptions

| Pin | Symbol      | Name/Description                                          | Plug Seq. | Notes |
|-----|-------------|-----------------------------------------------------------|-----------|-------|
| 1   | VeeT        | Transmitter Ground.                                       | 1         | 5     |
| 2   | Tx_Fault    | Transmitter Fault Indication.                             | 3         | 1     |
| 3   | Tx_Disable  | Transmitter Disable. Module disables on “high” or “open.” | 3         | 2     |
| 4   | MOD-DEF2    | Module Definition 2. 2-Wire Serial ID Interface.          | 3         | 3     |
| 5   | MOD-DEF1    | Module Definition 1. 2-Wire Serial ID Interface.          | 3         | 3     |
| 6   | MOD-DEF0    | Module Definition 0. Grounded within the module.          | 3         | 3     |
| 7   | Rate Select | Not Connected. Function not available.                    | 3         |       |
| 8   | LOS         | Loss of Signal.                                           | 3         | 4     |
| 9   | VeeR        | Receiver Ground.                                          | 1         | 5     |
| 10  | VeeR        | Receiver Ground.                                          | 1         | 5     |
| 11  | VeeR        | Receiver Ground.                                          | 1         | 5     |
| 12  | RD-         | Inverse Received Data Out.                                | 3         | 6     |
| 13  | RD+         | Received Data Out.                                        | 3         | 7     |
| 14  | VeeR        | Receiver Ground.                                          | 1         | 5     |
| 15  | VccR        | 3.3±5% Receiver Power.                                    | 2         | 7     |
| 16  | VccT        | 3.3±5% Transmitter Power.                                 | 2         | 7     |
| 17  | VeeT        | Transmitter Ground.                                       | 1         | 5     |
| 18  | TD+         | Transmitter Data In.                                      | 3         | 8     |
| 19  | TD-         | Inverse Transmitter Data In.                              | 3         | 8     |
| 20  | VeeT        | Transmitter Ground.                                       | 1         | 5     |

## Notes:

1. Tx\_Fault is an open collector/drain output that should be pulled up with a 4.7kΩ to 10kΩ resistor on the host board. Pull-up voltage between 2.0V and VccT/R+0.3V. When “high,” output indicates a laser fault of some kind. “Low” indicates normal operation. In the “low” state, the output will be pulled to <0.8V.
2. Tx\_Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7kΩ to 10kΩ resistor. Its states are:
  - Low (0V – 0.8V): Transmitter On.
  - (>0.8V and <2.0V): Undefined.
  - High (2.0V – 3.465V): Transmitter Disabled.
  - Open: Transmitter Disabled.
3. MOD-DEF0, 1, & 2. These are the module definition pins. They should be pulled up with a 4.7kΩ to 10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.
  - MOD-DEF0 is grounded by the module to indicate that the module is present.
  - MOD-DEF1 is the clock line of the 2-wire serial interface for optional serial ID.
  - MOD-DEF2 is the data line of the 2-wire serial interface for optional serial ID.

4. LOS (Loss of Signal) is an open collector/drain output that should be pulled up with a 4.7k $\Omega$  to 10k $\Omega$  resistor. Pull-up voltage between 2.0V and VccT/R+0.3V. When "high," this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). "Low" indicates normal operation. In the "low" state, the output will be pulled to <0.8V.
5. VeeR and VeeT may be internally connected within the SFP module.
6. RD-/+. These are the differential receiver outputs. They are AC-coupled 100 $\Omega$  differential lines which should be terminated with 100 $\Omega$  (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 400mV and 2000mV differential (200mV and 1000mV single-ended) when properly terminated.
7. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V $\pm$ 5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 $\Omega$  should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot-plugging of the SFP transceiver module will result in an in-rush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.
8. TD-/+. These are the differential transmitter inputs. They are AC-coupled differential lines with 100 $\Omega$  differential terminations inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 400mV and 2000mV (200mV and 1000mV single-ended).

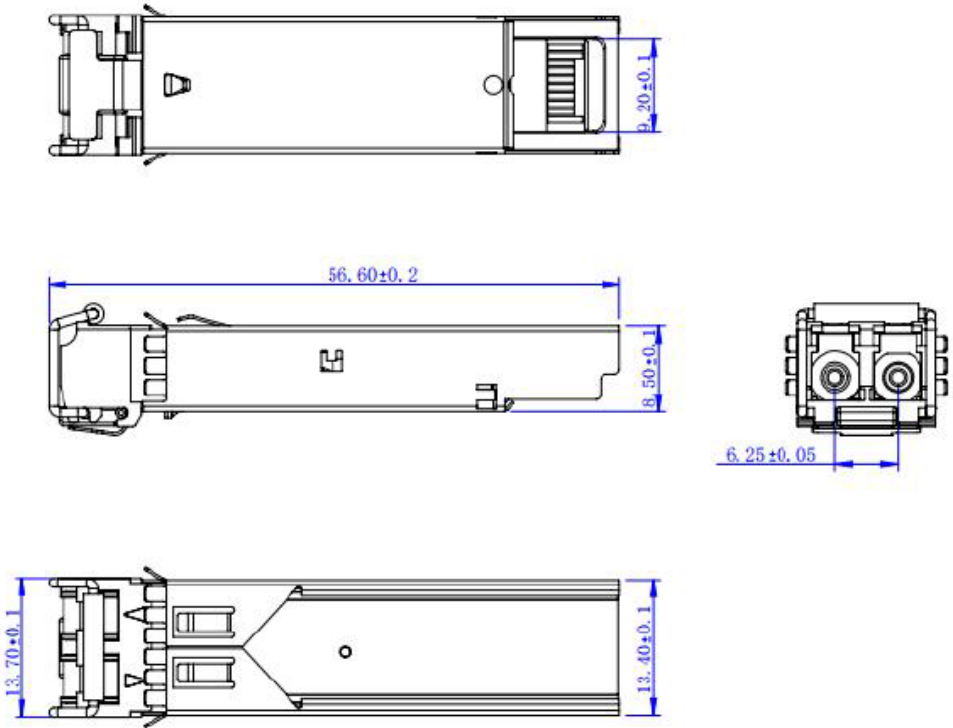
## Pin Connectors



Recommended Circuit Schematic



Mechanical Specifications



## 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.



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