

### **SFP-10GB-BXD32-40-N-V-OPC**

Alcatel-Lucent Nokia® Compatible TAA 10GBase-BX SFP+ Transceiver (SMF, 1330nmTx/1270nmRx, 40km, LC, DOM, -40 to 95C)

#### **Features**

- Low Power Dissipation
- Compliant with IEEE 802.3ae 10GBASE-E
- Compliant with SFP MSA, SFF 8431 Rev. 4.1
- LC Connector
- Metal Package for Lower EMI
- Up to 11.3Gbps 10km Data Links
- Single 3.3V Power Supply Voltage
- Operating Temperature: -40 to 95 Celsius
- RoHS Compliant and Lead-Free
- Excellent ESD Protection
- RoHS Compliant and Lead Free



#### **Applications:**

- 10GBase-BX Ethernet
- 8x/10x Fibre Channel
- Access, Metro and Enterprise

#### **Product Description**

This Alcatel-Lucent Nokia® compatible SFP+ transceiver provides 10GBase-BX throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1330nmTx/1270nmRx via an LC connector. This bidirectional unit must be used with another transceiver or network appliance of complementing wavelengths. It can operate at temperatures between -40 and 95C. Our transceiver is built to meet or exceed OEM specifications and is guaranteed to be 100% compatible with Alcatel-Lucent Nokia®. 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. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

## Absolute Maximum Ratings

| Parameter                  | Symbol | Min. | Typ. | Max. | Unit | Notes |
|----------------------------|--------|------|------|------|------|-------|
| Maximum Supply Voltage     | Vcc    | 0    |      | 4    | V    |       |
| Storage Temperature        | Tstg   | -40  |      | 85   | °C   |       |
| Operating Case Temperature | Tc     | -40  |      | 95   | °C   |       |
| Data Rate                  | DR     | 9.9  | 10.3 | 11.3 | Gbps |       |

### Notes:

1. Measured on the top side front center of the SFP module.

## Electrical Characteristics

| Parameter                              | Symbol       | Min.    | Typ. | Max.    | Unit  | Notes |
|----------------------------------------|--------------|---------|------|---------|-------|-------|
| Power Supply Voltage                   | Vcc          | 3.135   | 3.3  | 3.465   | V     |       |
| Power Supply Current                   | Icc          |         |      | 450     | mA    |       |
| <b>Transmitter</b>                     |              |         |      |         |       |       |
| Differential Input Impedance           | RIN          | 80      | 100  | 120     | Ω     |       |
| Differential Data Input Swing          | VIN,pp       | 180     |      | 800     | mVp-p |       |
| Data Input Rise/Fall Time              | Tr/Tf        | 15      |      | 40      | ps    |       |
| Tx_Disable Voltage                     | VD           | 2.0     |      | Vcc+0.3 | V     | 1     |
| Tx_Enable Voltage                      | VEN          | -0.3    |      | 0.8     | V     |       |
| Tx_Disable Assert Time                 | t_off        |         |      | 100     | μs    |       |
| Tx_Enable Assert Time                  | t_on         |         |      | 2       | ms    |       |
| Tx_Fault Assert Time for Cooled Module | tx_f_on      |         |      | 50      | ms    |       |
| Tx_Fault Reset Time                    | t_reset      | 10      |      |         | μs    | 2     |
| Initialization Time for Cooled Module  | t_start_up   |         |      | 90      | s     |       |
| <b>Receiver</b>                        |              |         |      |         |       |       |
| Differential Output Impedance          | ROUT         | 80      | 100  | 120     | Ω     |       |
| Differential Data Output Swing         | VOUT         | 300     |      | 800     | mVp-p |       |
| Data Output Rise/Fall Time (20-80%)    | Tr/Tf        |         |      | 45      | ps    |       |
| LOS Output High Voltage                | Vlosh        | Vcc-0.5 |      | Vcc+0.3 | V     | 1     |
| LOS Output Low Voltage                 | Vlosl        | 0       |      | 0.4     | V     |       |
| LOS Assert/De-Assert Time Delay        | T_los on/off |         |      | 100/100 | μs/μs |       |

### Notes:

1. Vcc is the voltage of the host board.
2. Time Tx\_Disable must be held "high" to reset the Tx\_Fault.

## Optical Characteristics

| Parameter                          | Symbol                                                          | Min. | Typ. | Max. | Unit  | Notes |
|------------------------------------|-----------------------------------------------------------------|------|------|------|-------|-------|
| Transmitter                        |                                                                 |      |      |      |       |       |
| Optical Center Wavelength          | $\lambda_C$                                                     | 1320 | 1330 | 1340 | nm    |       |
| Average Optical Power              | $P_{avg}$                                                       | 0    |      | 5    | dBm   | 1     |
| Extinction Ratio                   | ER                                                              | 3.5  |      |      | dB    |       |
| Spectral Width @-20dB              | $\Delta\lambda_{-20dB}$                                         |      |      | 1.0  | nm    |       |
| Side-Mode Suppression Ratio        | SMSR                                                            | 30   |      |      | dB    |       |
| Optical Power of Off Transmitter   | $P_{off}$                                                       |      |      | -30  | dBm   |       |
| Relative Intensity Noise           | $RIN_{12OMA}$                                                   |      |      | -128 | dB/Hz |       |
| Optical Return Loss Tolerance      |                                                                 |      |      | 12   | dB    |       |
| Transmitter Reflectance            |                                                                 |      |      | -12  | dB    |       |
| Transmitter and Dispersion Penalty | TDP                                                             |      |      | 3.2  | dB    |       |
| Transmitter Eye Mask Definition    | {X1, X2, X3, Y1, Y2, Y3} = {0.25, 0.40, 0.45, 0.25, 0.28, 0.40} |      |      |      |       |       |
| Receiver                           |                                                                 |      |      |      |       |       |
| Optical Center Wavelength          | $\lambda_C$                                                     | 1260 | 1270 | 1280 | nm    |       |
| Average Rx Sensitivity @10Gbps     | RSENS                                                           |      |      | -18  | dBm   | 2     |
| Maximum Input Power                | Pol                                                             | -7   |      |      | dBm   |       |
| Receiver Reflectance               |                                                                 |      |      | -12  | dB    |       |
| LOS Assert                         | LOSA                                                            | -35  |      |      | dBm   |       |
| LOS De-Assert                      | LOSD                                                            |      |      | -18  | dBm   |       |
| LOS Hysteresis                     |                                                                 | 0.5  | 2.5  | 5    | dB    |       |

### Notes:

1. The maximum Tx POUT is the lesser of the Class 1 eye safety limit and a maximum receiver input power level of 0dBm.
2. Measured with a PRBS of  $2^{31}-1$  at  $1 \times 10^{-12}$  BER and 3.5dB extinction ratio @10.3Gbps 12dB reflection.

## Pin Descriptions

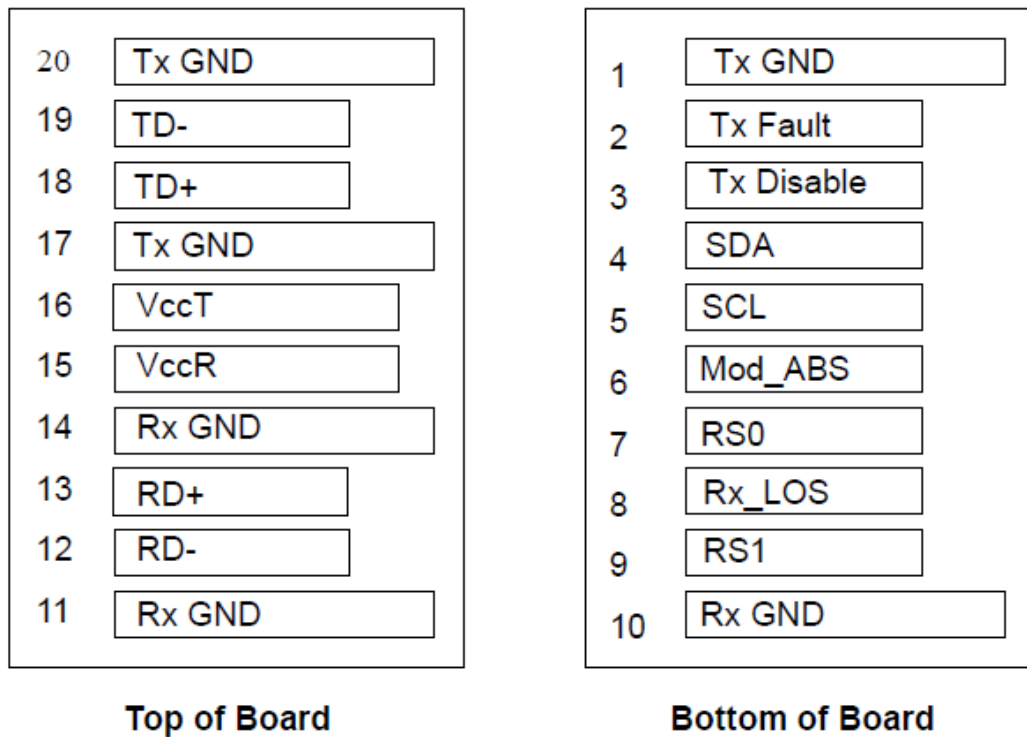
| Pin | Logic     | Symbol     | Name/Description                                                                                               | Plug Sequence | Notes |
|-----|-----------|------------|----------------------------------------------------------------------------------------------------------------|---------------|-------|
| 1   |           | GND        | Transmitter Ground.                                                                                            | 1             | 1     |
| 2   | LVTTL-O   | Tx_Fault   | Transmitter Fault Indication.                                                                                  | 3             | 2     |
| 3   | LVTTL-I   | Tx_Disable | Transmitter Disable.                                                                                           | 3             | 3     |
| 4   | LVTTL-I/O | SDA        | 2-Wire Serial Interface Data.                                                                                  | 3             | 4     |
| 5   | LVTTL-I/O | SCL        | 2-Wire Serial Interface Clock.                                                                                 | 3             | 4     |
| 6   |           | MOD_ABS    | Module Absent. Connected to the module GND.                                                                    | 3             | 5     |
| 7   | LVTTL-I   | RS0        | Rate Select 0. Not Implemented.                                                                                | 3             | 6     |
| 8   | LVTTL-O   | Rx_LOS     | Receiver Loss of Signal Indication. In FC, designated as Rx_LOS. In Ethernet, designated as Signal Detect Bar. | 3             | 7     |
| 9   | LVTTL-I   | RS1        | Rate Select 1. Not Implemented.                                                                                | 3             | 6     |
| 10  |           | GND        | Receiver Ground.                                                                                               | 1             | 1     |
| 11  |           | GND        | Receiver Ground.                                                                                               | 1             | 1     |
| 12  | CML-O     | RD-        | Receiver Negative Data Out.                                                                                    | 3             |       |
| 13  | CML-O     | RD+        | Receiver Positive Data Out.                                                                                    | 3             |       |
| 14  |           | GND        | Receiver Ground.                                                                                               | 1             | 1     |
| 15  |           | VccRx      | 3.3V±5% Receiver Power.                                                                                        | 2             |       |
| 16  |           | VccTx      | 3.3V±5% Transmitter Power.                                                                                     | 2             |       |
| 17  |           | GND        | Transmitter Ground.                                                                                            | 1             | 1     |
| 18  | CML-I     | TD+        | Transmitter Positive Data In.                                                                                  | 3             |       |
| 19  | CML-I     | TD-        | Transmitter Negative Data In.                                                                                  | 3             |       |
| 20  |           | GND        | Transmitter Ground.                                                                                            | 1             | 1     |

## Notes:

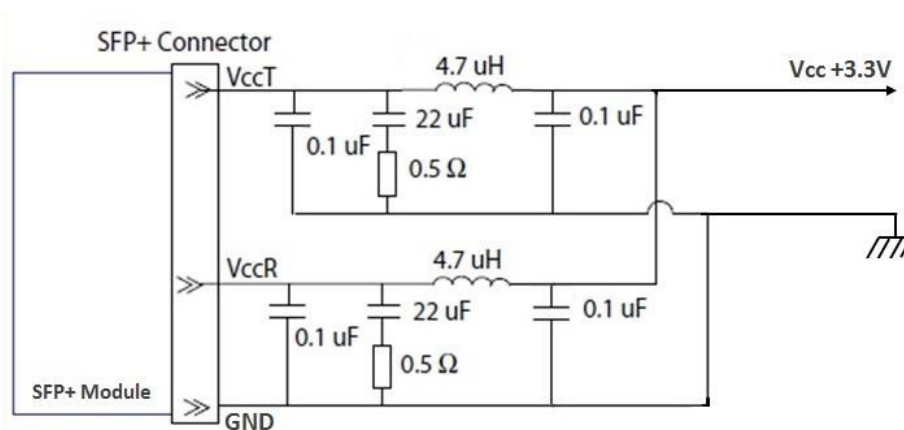
1. The module ground contacts shall be isolated from the module case.
2. Tx\_Fault is an open collector/drain output that shall be pulled up with a 4.7kΩ to 10kΩ on the host board. Pull-up voltage between 2.0V and VccT+0.5V. When “high,” output indicates a laser fault of some kind. When “low,” output indicates normal operation. The LD output is not turned off in case of Tx\_Fault.
3. Tx\_Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the TRx with 4.7kΩ to 10kΩ to the VccT.
4. SDA and SCL should be pulled up with a 4.7kΩ to 10kΩ on the host board. The pull-up voltage shall be VccT. SCL is the clock line of the 2-wire serial interface for serial ID. SDA is the data line of the 2-wire serial interface for serial ID.
5. MOD\_ABS is connected to the module ground. The host may pull the contact up to the Vcc on the host board with a resistor in the range 4.7kΩ to 10kΩ. MOD\_ABS is asserted “high” when the SFP+ module is physically absent from a host slot. In the SFP MSA (INF-8074i), this contact has the same function but is called MOD\_DEF0.

6. RS0 and RS1 are module input rate select contacts but are not used. Both are pulled “low” to the module ground with a  $>30k\Omega$  resistor in the module.
7. LOS is an open collector output and shall be pulled up with a  $4.7k\Omega$  to  $10k\Omega$  on the host board. Pull-up voltage between 2.0 and  $V_{ccR}+0.3$ . “Logic 0” indicates normal operation.

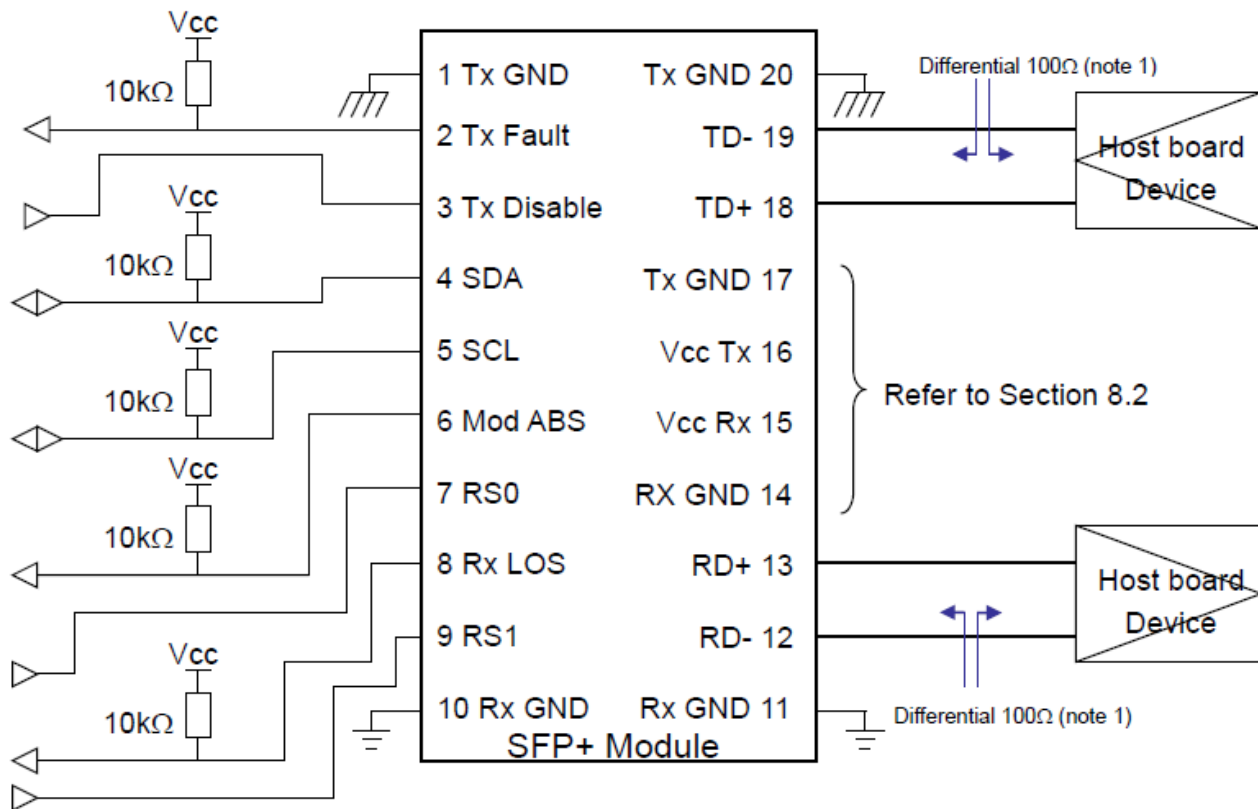
### Pin Assignments



### Recommended Host Board Supply Filtering Network



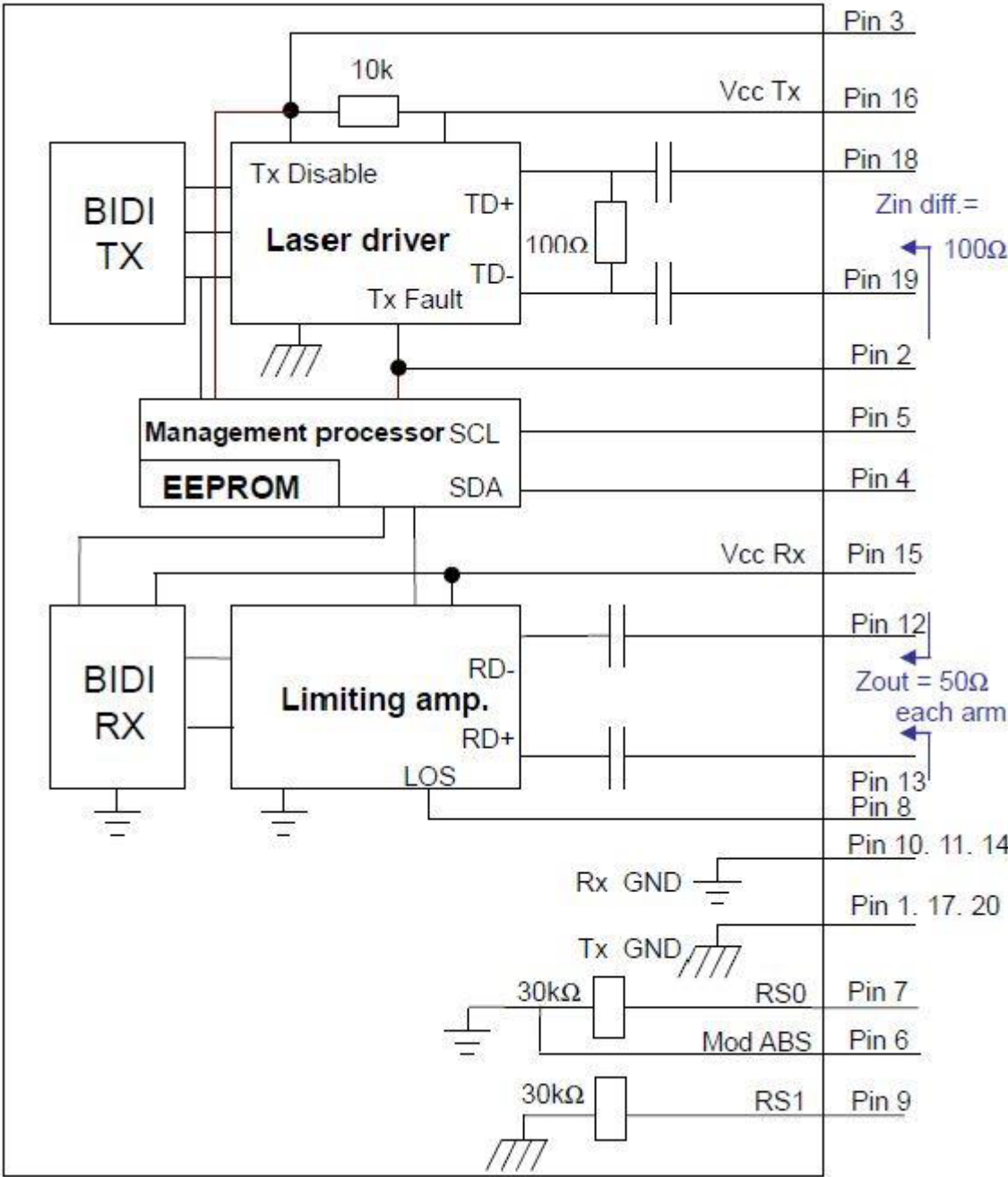
## Recommended Host Board Interface



## Notes:

1. Host board output device circuit in the transmitter side and host board input device circuit in the receiver should be carefully designed to meet 100Ω differential impedance matching. Also necessary is the DC bias circuit of each input and output by taking into account the AC coupling of data input and output of the SFP+ module.

Block Diagram



Mechanical Specifications

