

### 3AL82187AA-C

Alcatel-Lucent Nokia® 3AL82187AA Compatible TAA Compliant 400GBase-LR8 QSFP-DD Transceiver (SMF, 8x50G PAM4, 10km, LC, DOM)

#### Features:

- Hot-pluggable QSFP-DD Type 2 form factor
- Supports 425Gb/s aggregate bit rate
- Power dissipation < 13W
- Single 3.3V power supply
- Single-mode Fiber
- Aligned with IEEE 802.3bs
- Operating case temperature: 0C to 70C



#### Applications:

- 400GBase Ethernet
- Access and Enterprise

#### Product Description

This Alcatel-Lucent Nokia® 3AL82187AA compatible transceiver provides 400GBase-LR8 8x50G PAM4 throughput up to 10km over single-mode fiber (SMF) at a wavelength of 1310nm using an LC connector. It is built to MSA standards and is uniquely serialized and data-traffic and application tested to ensure that they will integrate into your network seamlessly. 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.")



## 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

## Absolute Maximum Ratings

| Parameter                           | Symbol            | Min. | Max.                 | Unit | Notes |
|-------------------------------------|-------------------|------|----------------------|------|-------|
| Power Supply Voltage                | VCC               | -0.5 | 4.0                  | V    |       |
| Storage Temperature                 | Ts                | -40  | +85                  | °C   |       |
| Case Operating Temperature          | Top               | 0    | +70                  | °C   |       |
| Relative Humidity (non-condensing)  | RH                | 15   | 85                   | %    |       |
| Receiver Damage Threshold, per Lane | P <sub>Rdmg</sub> | 6.3  |                      | dBm  |       |
| Bit Rate (all wavelengths combined) | BR                |      | 425                  | Gb/s | 1     |
| Bit Error Ratio                     | BER               |      | 2.4x10 <sup>-4</sup> |      | 2     |
| <b>Maximum Supported Distances</b>  |                   |      |                      |      |       |
| Fiber Type                          |                   |      |                      |      |       |
| SMF per G.652                       | L <sub>max1</sub> |      | 10                   | km   |       |

## Notes:

1. Supports 400GBASE-LR8 per IEEE P802.3bs.
2. As defined by IEEE P802.3bs.

**Electrical Characteristics (EOL, T<sub>OP</sub> = 0 to +70°C, V<sub>CC</sub> = 3.135 to 3.465 Volts)**

| Parameter  | Symbol                     | Min.                             | Typ. | Max.  | Unit | Notes |
|--|----------------------------|----------------------------------|------|-------|------|-------|
| Supply Voltage                                     | V <sub>CC</sub>            | 3.135                            | 3.3  | 3.465 | V    |       |
| Supply Current                                     | I <sub>CC</sub>            |                                  |      | 3.83  | A    |       |
| Module total power                                 | P                          |                                  |      | 13    | W    | 1     |
| <b>Transmitter</b>                                 |                            |                                  |      |       |      |       |
| Signaling Rate, each Lane                          | V <sub>in</sub> , pp, diff | 26.5625 ± 100 ppm                |      |       | GBd  |       |
| Differential data input voltage per lane           | TP1a                       | 900                              |      |       | mVpp | 1     |
| Differential input return loss                     |                            | Per equation (83E-5) IEEE802.3bm |      |       | dB   |       |
| Differential to common mode input return loss      |                            | Per equation (83E-6) IEEE802.3bm |      |       | dB   |       |
| Differential termination mismatch                  |                            |                                  |      | 10    | %    |       |
| Module stress input test                           |                            | Per 120E.3.4.1 IEEE802.3bs       |      |       |      | 3     |
| Single-ended voltage tolerance range               |                            | -0.4                             |      | 3.3   | V    |       |
| DC common mode voltage                             |                            | -350                             |      | 2850  | mV   | 4     |
| <b>Receiver</b>                                    |                            |                                  |      |       |      |       |
| Signaling Rate, each lane                          |                            | 26.5625 ± 100 ppm                |      |       | GBd  |       |
| AC common-mode output voltage (RMS)                |                            |                                  |      | 17.5  | mV   |       |
| Differential output voltage                        |                            |                                  |      | 900   | mV   |       |
| Near-end ESMW (Eye symmetry mask width)            |                            | 0.265                            |      |       | UI   |       |
| Near-end Eye height, differential (min)            |                            | 70                               |      |       | mV   |       |
| Far-end ESMW (Eye symmetry mask width)             |                            | 0.2                              |      |       | UI   |       |
| Far-end Eye height, differential (min)             |                            | 30                               |      |       | mV   |       |
| Far-end pre-cursor ISI ratio                       |                            | -4.5                             |      | 2.5   | dB   |       |
| Differential output return loss                    |                            | Per equation 83E-2 IEEE802.3bm   |      |       |      |       |
| Common to differential mode conversion return loss |                            | Per equation 83E-3 IEEE802.3bm   |      |       |      |       |
| Differential termination mismatch                  |                            |                                  |      | 10    | %    |       |
| Transition time (min, 20% to 80%)                  |                            | 9.5                              |      |       | ps   |       |
| DC common mode voltage (min)                       |                            | -350                             |      | 2850  | mV   | 4     |

**Notes:**

1. Maximum total power value is specified across the full temperature and voltage range.
2. With the exception to 120E.3.1.2 that the pattern is PRBS31Q or scrambled idle.
3. Meets specified BER
4. DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.

**Optical Characteristics (EOL, T<sub>OP</sub> = 0 to +70°C, V<sub>CC</sub> = 3.135 to 3.465 Volts)**

Meets 400GBASE-LR8 as being defined by IEEE P802.3bs

| Parameter  | Symbol | Min.   | Typ. | Max. | Unit  | Notes |
|--|--------|--|------|------|-------|-------|
| <b>Transmitter</b>   |        |  |      |      |       |       |
| Signaling rate (each lane (range))                                       |        | 26.5625 ± 100 ppm  |      |      | GBd   |       |
| Modulation Format  |        | PAM4   |      |      |       |       |
| Lane wavelengths (range)   |        | 1272.55 to 1274.54<br>1276.89 to 1278.89<br>1281.25 to 1283.27<br>1285.65 to 1287.68<br>1294.53 to 1296.59<br>1299.02 to 1301.09<br>1303.54 to 1305.63<br>1308.09 to 1310.19 |      |      | nm    |       |
| Side-mode suppression ratio (SMSR)                                       |        | 30   |      |      | dB    |       |
| Total average launch power   |        |  |      | 13.2 | dBm   |       |
| Average launch power, each lane  |        |  |      | 5.3  | dBm   | 1     |
| Average launch power, each lane  |        | -2.8   |      |      | dBm   | 2     |
| Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ), each lane    |        | 0.2  |      | 5.7  | dBm   | 3     |
| Difference in launch power between any two lanes (OMA <sub>outer</sub> ) |        |  |      | 4    | dB    |       |
| Launch power in OMA <sub>outer</sub> minus TDECQ, each lane              |        | -1.1   |      |      | dBm   |       |
| Transmitter and dispersion eye closure for PAM4 (TDECQ), each lane       |        |  |      | 3.3  | dB    |       |
| Average launch power of OFF transmitter, each lane                       |        |  |      | -30  | dBm   |       |
| Extinction ratio   |        | 3.5  |      |      | dB    |       |
| RIN <sub>15.1OMA</sub>   |        |  |      | -132 | dB/Hz |       |
| Optical return loss tolerance  |        |  |      | 15.1 | dB    |       |
| Transmitter reflectance  |        |  |      | -26  | dB    | 4     |
| <b>Receiver</b>  |        |  |      |      |       |       |
| Signaling rate (each lane (range))                                       |        | 26.5625 ± 100 ppm  |      |      | GBd   |       |
| Modulation Format  |        | PAM4   |      |      |       |       |
| Lane wavelengths (range)   |        | 1272.55 to 1274.54<br>1276.89 to 1278.89<br>1281.25 to 1283.27<br>1285.65 to 1287.68<br>1294.53 to 1296.59<br>1299.02 to 1301.09<br>1303.54 to 1305.63<br>1308.09 to 1310.19 |      |      | nm    |       |
| Damage threshold, each lane  |        | 6.3  |      |      | dBm   | 5     |
| Average receive power, each lane   |        |  |      | 5.3  | dBm   |       |
| Average receive power, each lane   |        | -9.1   |      |      | dBm   | 6     |

|   |  |      |  |      |     |   |
|---|--|------|--|------|-----|---|
| Receive power (OMA <sub>outer</sub> ), each lane                          |  |      |  | 5.7  | dBm |   |
| Difference in receive power between any two lanes (OMA <sub>outer</sub> ) |  |      |  | 4.5  | dBm |   |
| Receiver reflectance  |  |      |  | -26  | dB  |   |
| Receiver sensitivity (OMA <sub>outer</sub> ), each lane                   |  |      |  | -7.1 | dBm | 7 |
| Stressed receiver sensitivity (OMA <sub>outer</sub> ), each lane          |  |      |  | -4.7 | dBm | 8 |
| <b>Conditions for Stress Receiver Sensitivity Test</b>                    |  |      |  |      |     |   |
| Stressed eye closure for PAM4 (SECQ), lane under test                     |  | 3.3  |  |      | dB  | 9 |
| OMA <sub>outer</sub> of each aggressor lane                               |  | -0.2 |  |      | dBm | 9 |

**Notes:**

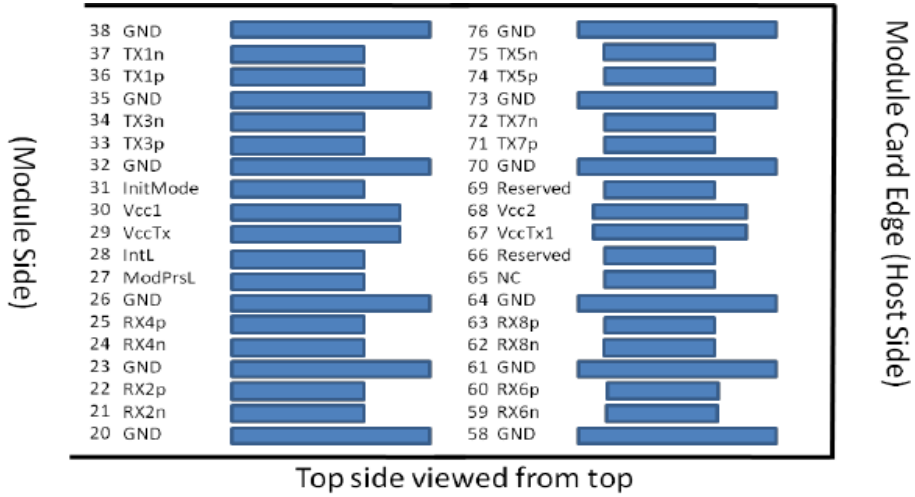
1. As the total average launch power limit has to be met, not all of the lanes can operate at the maximum average launch power, each lane.
2. Average launch power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
3. Even if the TDECQ < 1 dB, the OMA<sub>outer</sub> (min) must exceed this value
4. Transmitter reflectance is defined looking into the transmitter
5. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.
6. Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
7. Receiver sensitivity (OMA<sub>outer</sub>), each lane (max) is informative.
8. Measured with conformance test signal at TP3 (see 122.8.9) for the BER specified in 122.1.1.
9. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

## Pin Descriptions

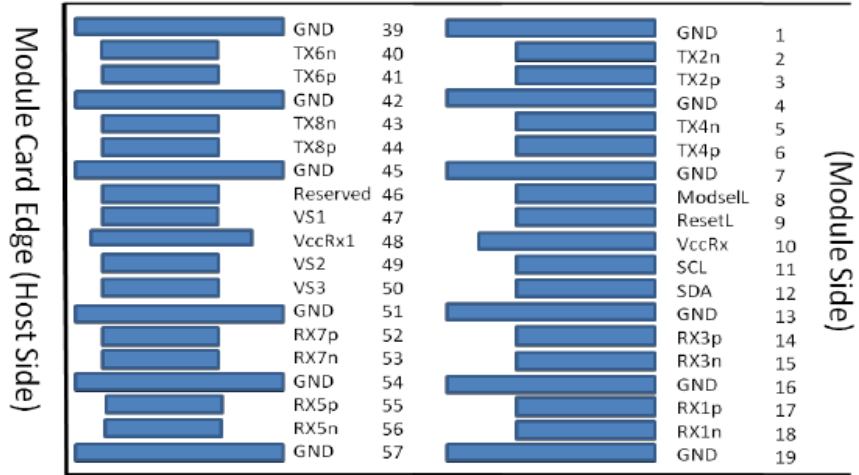
| Pin | Logic       | Symbol   | Name/Descriptions   | Plug Sequence |
|-----|-------------|----------|---|---------------|
| 1   |             | GND      | Ground  | 1B            |
| 2   | CML-I       | Tx2n     | Transmitter Inverted Data Input   | 3B            |
| 3   | CML-I       | Tx2p     | Transmitter Non-Inverted Data Input   | 3B            |
| 4   |             | GND      | Ground  | 1B            |
| 5   | CML-I       | Tx4n     | Transmitter Inverted Data Input   | 3B            |
| 6   | CML-I       | Tx4p     | Transmitter Non-Inverted Data Input   | 3B            |
| 7   |             | GND      | Ground  | 1B            |
| 8   | LVTTTL-I    | ModSelL  | Module Select   | 3B            |
| 9   | LVTTTL-I    | ResetL   | Module Reset  | 3B            |
| 10  |             | VccRx    | +3.3V Power Supply Receiver   | 2B            |
| 11  | LVC MOS-I/O | SCL      | 2-wire serial interface clock   | 3B            |
| 12  | LVC MOS-I/O | SDA      | 2-wire serial interface data  | 3B            |
| 13  |             | GND      | Ground  | 1B            |
| 14  | CML-O       | Rx3p     | Receiver Non-Inverted Data Output   | 3B            |
| 15  | CML-O       | Rx3n     | Receiver Inverted Data Output   | 3B            |
| 16  | GND         | Ground   | 1B  |               |
| 17  | CML-O       | Rx1p     | Receiver Non-Inverted Data Output   | 3B            |
| 18  | CML-O       | Rx1n     | Receiver Inverted Data Output   | 3B            |
| 19  |             | GND      | Ground  | 1B            |
| 20  |             | GND      | Ground  | 1B            |
| 21  | CML-O       | Rx2n     | Receiver Inverted Data Output   | 3B            |
| 22  | CML-O       | Rx2p     | Receiver Non-Inverted Data Output   | 3B            |
| 23  |             | GND      | Ground  | 1B            |
| 24  | CML-O       | Rx4n     | Receiver Inverted Data Output   | 3B            |
| 25  | CML-O       | Rx4p     | Receiver Non-Inverted Data Output   | 3B            |
| 26  |             | GND      | Ground  | 1B            |
| 27  | LVTTTL-O    | ModPrsL  | Module Present  | 3B            |
| 28  | LVTTTL-O    | IntL     | Interrupt   | 3B            |
| 29  |             | VccTx    | +3.3V Power supply transmitter  | 2B            |
| 30  |             | Vcc1     | +3.3V Power supply  | 2B            |
| 31  | LVTTTL-I    | InitMode | Initialization mode; In legacy QSFP applications, the InitMode pad is called LPMODE | 3B            |
| 32  |             | GND      | Ground  | 1B            |
| 33  | CML-I       | Tx3p     | Transmitter Non-Inverted Data Input   | 3B            |
| 34  | CML-I       | Tx3n     | Transmitter Inverted Data Input   | 3B            |
| 35  |             | GND      | Ground  | 1B            |
| 36  | CML-I       | Tx1p     | Transmitter Non-Inverted Data Input   | 3B            |
| 37  | CML-I       | Tx1n     | Transmitter Inverted Data Input   | 3B            |
| 38  |             | GND      | Ground  | 1B            |

|    |       |          |                                     |    |
|----|-------|----------|-------------------------------------|----|
| 39 |       | GND      | Ground                              | 1A |
| 40 | CML-I | Tx6n     | Transmitter Inverted Data Input     | 3A |
| 41 | CML-I | Tx6p     | Transmitter Non-Inverted Data Input | 3A |
| 42 |       | GND      | Ground                              | 1A |
| 43 | CML-I | Tx8n     | Transmitter Inverted Data Input     | 3A |
| 44 | CML-I | Tx8p     | Transmitter Non-Inverted Data Input | 3A |
| 45 |       | GND      | Ground                              | 1A |
| 46 |       | Reserved | For future use                      | 3A |
| 47 |       | VS1      | Module Vendor Specific 1            | 3A |
| 48 |       | VccRx1   | 3.3V Power Supply                   | 2A |
| 49 |       | VS2      | Module Vendor Specific 2            | 3A |
| 50 |       | VS3      | Module Vendor Specific 3            | 3A |
| 51 |       | GND      | Ground                              | 1A |
| 52 | CML-O | Rx7p     | Receiver Non-Inverted Data Output   | 3A |
| 53 | CML-O | Rx7n     | Receiver Inverted Data Output       | 3A |
| 54 |       | GND      | Ground                              | 1A |
| 55 | CML-O | Rx5p     | Receiver Non-Inverted Data Output   | 3A |
| 56 | CML-O | Rx5n     | Receiver Inverted Data Output       | 3A |
| 57 |       | GND      | Ground                              | 1A |
| 58 |       | GND      | Ground                              | 1A |
| 59 | CML-O | Rx6n     | Receiver Inverted Data Output       | 3A |
| 60 | CML-O | Rx6p     | Receiver Non-Inverted Data Output   | 3A |
| 61 |       | GND      | Ground                              | 1A |
| 62 | CML-O | Rx8n     | Receiver Inverted Data Output       | 3A |
| 63 | CML-O | Rx8p     | Receiver Non-Inverted Data Output   | 3A |
| 67 |       | GND      | Ground                              | 1A |
| 68 |       | NC       | No Connect                          | 3A |
| 69 |       | Reserved | For future use                      | 3A |
| 70 |       | VccTx1   | 3.3V Power Supply                   | 2A |
| 71 |       | Vcc2     | 3.3V Power Supply                   | 2A |
| 72 |       | Reserved | For Future Use                      | 3A |
| 73 |       | GND      | Ground                              | 1A |
| 74 | CML-I | Tx7p     | Transmitter Non-Inverted Data Input | 3A |
| 75 | CML-I | Tx7n     | Transmitter Inverted Data Input     | 3A |
| 76 |       | GND      | Ground                              | 1A |

# MSA Compliant Connector

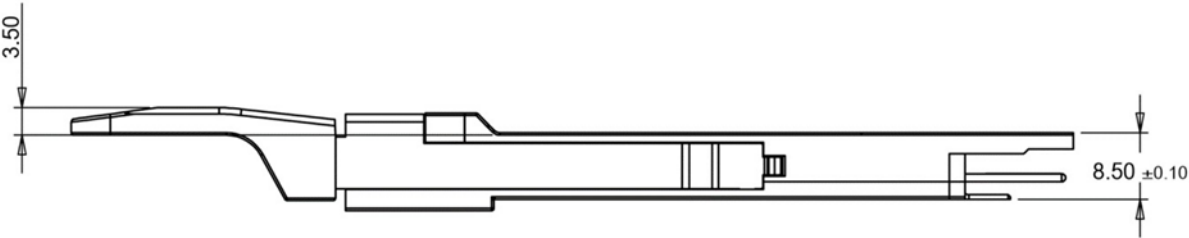
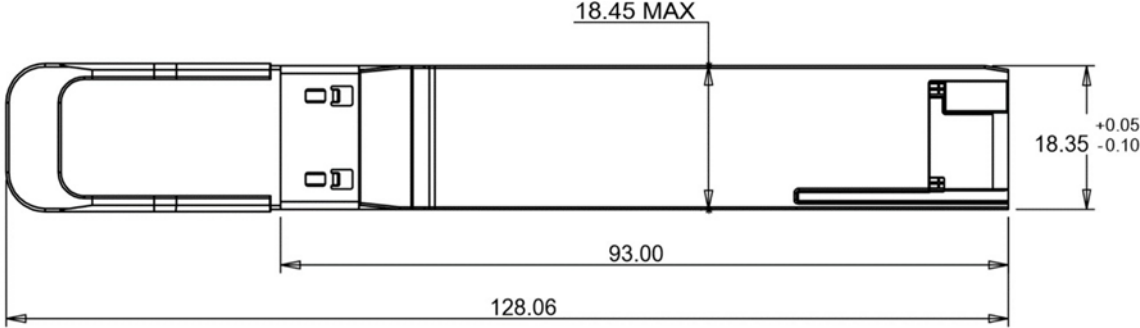


Legacy QSFP28 Pads      Additional QSFP-DD Pads



Additional QSFP-DD Pads      Legacy QSFP28 Pads

**Mechanical Specifications**



## About ProLabs

Our extensive experience comes as standard. For over 20 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 more than 100 optical switching and transport platforms.

## A 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 1.6T 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.

## The Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure compatible products, and immediate answers to your questions. 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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