



## SFP-10GBASE-LR-20-AL-SKY

Alcatel-Lucent Nokia® Compatible 10GBase-LR SFP+ Transceiver (SMF, 1310nm, 20km, LC, DOM)

### Product Description

This Alcatel-Lucent Nokia® compatible SFP+ transceiver provides 10GBase-LR throughput up to 20km over single-mode fiber (SMF) using a wavelength of 1310nm 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 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.

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

### Features:

- Compliant with IEEE802.3ae 10GBASE-LR/LW
- 1310nm DFB-LD Transmitter
- Compliant with MSA SFP+ Specification SFF-8431
- Single 3.3V Power Supply and TTL Logic Interface
- Duplex LC Connector
- Distance up to 20km
- Hot-Pluggable
- Commercial Temperature 0 to 70 Celsius
- Excellent ESD Protection
- Metal with Lower EMI
- RoHS compliant and Lead Free



### Applications:

- 1000Base-LX/10GBASE-LR Ethernet
- Access and Enterprise
- 1x Fibre Channel

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*For your product safety, please read the following information carefully before any manipulation of the transceiver:*



#### **ESD**

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all others electrical input pins, tested per MIL-STD-883G, Method 3015.4 / JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module.



#### **LASER SAFETY**

This is a Class1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

*The optical ports of the module need to be terminated with an optical connector or with a dust plug in order to avoid contamination.*

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## Absolute Maximum Ratings

| Parameter                  | Symbol           | Min. | Typ.    | Max.              | Unit | Notes |
|----------------------------|------------------|------|---------|-------------------|------|-------|
| Maximum Supply Voltage     | V <sub>CC</sub>  | -0.5 |         | 4                 | V    | 1     |
| Storage Temperature        | T <sub>stg</sub> | -40  |         | 85                | °C   |       |
| Operating Case Temperature | T <sub>c</sub>   | 0    |         | 70                | °C   |       |
| Relative Humidity          | RH               | 0    |         | 85                | %    |       |
| Data Rate                  | DR               | 9.83 | 10.3125 | 11.3              | Gb/s | 2     |
| Bit Error Rate             | BER              |      |         | 10 <sup>-12</sup> |      |       |

## Notes:

1. For electrical interface
2. IEEE 802.3ae

## Electrical Characteristics

| Parameter                            | Symbol                         | Min.            | Typ. | Max.                 | Unit | Notes |
|--------------------------------------|--------------------------------|-----------------|------|----------------------|------|-------|
| Module Supply Voltage                | V <sub>CC</sub>                | 3.14            | 3.3  | 3.46                 | V    |       |
| Module Supply Current                | I <sub>CC</sub>                |                 | 200  | 310                  | mA   |       |
| Power Dissipation                    | PD                             |                 | 0.65 | 1.0                  | W    |       |
| Transmitter                          |                                |                 |      |                      |      |       |
| Input Differential Impedance         | R <sub>IN</sub>                |                 | 100  |                      | Ω    |       |
| Differential Data Input Swing        | V <sub>IN</sub> PP             | 180             |      | 700                  | mV   |       |
| Transmit Disable Voltage             | V <sub>D</sub>                 | 2               |      | V <sub>CC</sub>      | V    |       |
| Transmit Enable Voltage              | V <sub>EN</sub>                | V <sub>EE</sub> |      | V <sub>EE</sub> +0.8 | V    |       |
| Receiver                             |                                |                 |      |                      |      |       |
| Differential Data Output Swing       | V <sub>OUT</sub> PP            | 300             |      | 850                  | mV   |       |
| Data Output Rise/Fall Time (20%-80%) | t <sub>r</sub> /t <sub>f</sub> | 28              |      |                      | ps   |       |
| LOS Assert                           | V <sub>LOS</sub> A             | 2               |      | V <sub>CC</sub> HOST | V    |       |
| LOS De-Assert                        | V <sub>LOS</sub> D             | V <sub>EE</sub> |      | V <sub>EE</sub> +0.5 | V    |       |

## Optical Characteristics

| Parameter                       | Symbol               | Min.  | Typ. | Max.  | Unit  | Notes |
|---------------------------------|----------------------|-------|------|-------|-------|-------|
| Transmitter                     |                      |       |      |       |       |       |
| Output Optical Power            | P <sub>TX</sub>      | -8.2  |      | 0.5   | dBm   | 1     |
| Optical Center Wavelength       | $\lambda_c$          | 1260  |      | 1355  | nm    |       |
| Optical Modulation Amplitude    | OMA                  | -5.2  |      |       | dBm   | 2     |
| Extinction Ratio                | ER                   | 3.5   | 5.5  |       | dB    |       |
| Spectral Width(-20dB)           | $\Delta\lambda$      |       |      | 1     | nm    |       |
| Side Mode Suppression Ratio     | SMSR                 | 30    |      |       | dB    |       |
| Relative Intensity Noise        | RIN                  |       |      | -128  | dB/Hz |       |
| Transmitter Dispersion Penalty  | TDP                  |       |      | 3.2   | dB    |       |
| Launch Power of OFF Transmitter | P <sub>OUT_OFF</sub> |       |      | -30   | dBm   | 1     |
| Transmitter Jitter              |                      |       |      |       |       | 2     |
| Receiver                        |                      |       |      |       |       |       |
| Optical Center Wavelength       | $\lambda_c$          | 1260  |      | 1600  | nm    |       |
| Average Receive Power           | P <sub>RX</sub>      | -14.4 |      | 0.5   | dBm   |       |
| Receiver Sensitivity @10.3Gb/s  | R <sub>X_SEN</sub>   |       |      | -14.4 | dBm   | 3     |
| Receiver Reflectance            | TR <sub>RX</sub>     |       |      | -12   | dB    |       |
| LOS Assert                      | LOS <sub>A</sub>     | -30   |      |       | dBm   |       |
| LOS De-Assert                   | LOS <sub>D</sub>     |       |      | -17   | dBm   |       |
| LOS Hysteresis                  | LOS <sub>H</sub>     | 0.5   |      |       | dB    |       |

### Notes:

1. Average
2. According to IEEE 802.3ae requirement.
3. Test the resulting value using the minimum ER value within the defined range; BER<10<sup>-12</sup>; 2<sup>31</sup>-1 PRBS.

## Pin Descriptions

| Pin | Symbol     | Name/Descriptions                                                         | Ref. |
|-----|------------|---------------------------------------------------------------------------|------|
| 1   | VeeT       | Transmitter Ground.                                                       | 1    |
| 2   | Tx_Fault   | Transmitter Fault. LVTTTL-O. "High" indicates a fault condition.          | 2    |
| 3   | Tx_Disable | Transmitter Disable. LVTTTL-I. "High" or "open" disables the transmitter. | 3    |
| 4   | SDA        | 2-Wire Serial Interface Data. LVCMOS-I/O. MOD-DEF2.                       | 4    |
| 5   | SCL        | 2-Wire Serial Interface Clock. LVCMOS-I/O. MOD-DEF1.                      | 4    |
| 6   | MOD_ABS    | Module Absent (Output). Connected to VeeT or VeeR in the module.          | 5    |
| 7   | RS0        | N/A.                                                                      | 6    |
| 8   | Rx_LOS     | Receiver Loss of Signal. LVTTTL-O.                                        | 2    |
| 9   | RS1        | N/A.                                                                      | 6    |
| 10  | VeeR       | Receiver Ground.                                                          | 1    |
| 11  | VeeR       | Receiver Ground.                                                          | 1    |
| 12  | RD-        | Inverse Received Data Out. CML-O.                                         |      |
| 13  | RD+        | Received Data Out. CML-O.                                                 |      |
| 14  | VeeR       | Receiver Ground.                                                          |      |
| 15  | VccR       | +3.3V Receiver Power.                                                     |      |
| 16  | VccT       | +3.3V Transmitter Power.                                                  |      |
| 17  | VeeT       | Transmitter Ground.                                                       | 1    |
| 18  | TD+        | Transmitter Data In. CML-I.                                               |      |
| 19  | TD-        | Inverse Transmitter Data In. CML-I.                                       |      |
| 20  | VeeT       | Transmitter Ground.                                                       | 1    |

## Notes:

1. The module signal grounds are isolated from the module case.
2. This is an open collector/drain output that on the host board requires a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to Host\_Vcc.
3. This input is internally biased high with a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccT.
4. 2-Wire Serial Interface Clock and Data lines require an external pull-up resistor dependent on the capacitance load.
5. This is a ground return that, on the host board, requires a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to the Host\_Vcc.
6. Rate select can also be set through the 2-wire bus in accordance with SFF-8472 v. 12.1. Rx Rate Select is set at Bit 3, Byte 110, and Address A2h, and Tx Rate Select is set at Bit 3, Byte 118, and Address A2h.  
**Note:** Writing a "1" selects maximum bandwidth operation. Rate select is the logic OR of the input state of Rate Select Pin and 2-wire bus.

Electrical Pin-out Details



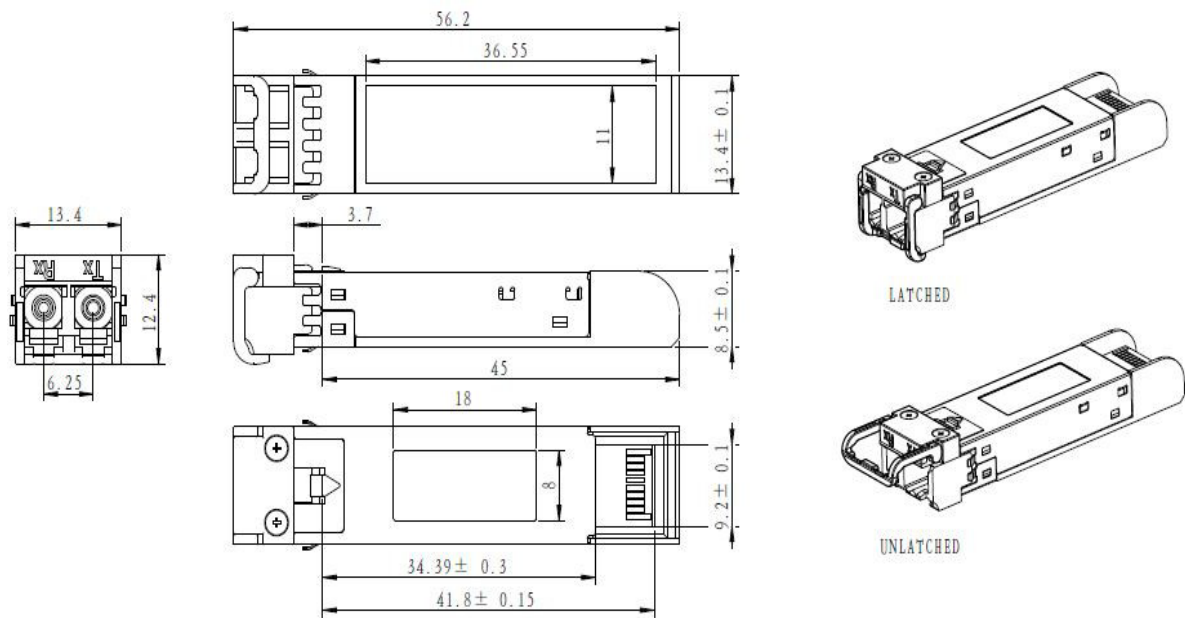
Block Diagram



Mechanical Specifications

ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED

UNIT: mm



EEPROM Information

EEPROM memory map-specific data field description is as below:

| 2 wire address 1010000X (A0h)           | 2 wire address 1010001X (A2h)             |
|-----------------------------------------|-------------------------------------------|
| 0                                       | 0                                         |
| Serial ID Defined by SFP MSA (96 bytes) | Alarm and Warning Thresholds (56 bytes)   |
| 95                                      | 55                                        |
| Vendor Specific (32 bytes)              | Cal Constants (40 bytes)                  |
| 127                                     | 95                                        |
| Reserved, SFF8079 (128 bytes)           | Real Time Diagnostic Interface (24 bytes) |
|                                         | 119                                       |
|                                         | Vendor Specific (8 bytes)                 |
|                                         | 127                                       |
|                                         | User Writable EEPROM (120 bytes)          |
|                                         | 247                                       |
| 255                                     | Vendor Specific (8 bytes)                 |
|                                         | 255                                       |

# About Skylane Optics

Skylane is a leading provider of transceivers for optical communication.

We offer an extensive portfolio for the enterprise, access, datacenter and metropolitan fiber optical market as well as for smart home applications and home networks.

We cover the European, South American and North American market with a strong partner network and have offices in Belgium, Brazil, Sweden and USA.

Our offerings are characterized by high quality and performance. In combination with our strong technical support, we enable our customers to build cost optimized network solutions.

We offer an extensive range of high-quality products including transceivers (Optical and copper), Active Optical Cable (AOC), Direct Attach Cable (DAC), Mux/Demux, Coding Box.

