



## 00D6222-SKY

IBM® 00D6222 Compatible 40GBase-LR4 QSFP+ Transceiver (SMF, 1270nm to 1330nm, 10km, LC, DOM)

### Product Description

This IBM® 00D6222 compatible QSFP+ transceiver provides 40GBase-LR4 throughput up to 10km over single-mode fiber (SMF) using a wavelength of 1270nm to 1330nm via an LC connector. Our transceiver is built to meet or exceed OEM specifications and is guaranteed to be 100% compatible with IBM®. 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:

- SFF-8436 Compliance
- Duplex LC Connector
- Commercial Temperature 0 to 70 Celsius
- Single-mode Fiber
- Hot Pluggable
- Excellent ESD Protection
- Metal with Lower EMI
- RoHS Compliant and Lead Free



### Applications:

- 40GBase Ethernet
- Access and Enterprise

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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 |
|----------------------------|--------|------|------|------|------|
| Storage Temperature        | TS     | -40  |      | 85   | °C   |
| Relative Humidity          | Rh     | 0    |      | 85   | %    |
| Supply Voltage             | Vcc    | -0.5 |      | 4.0  | V    |
| Case Operating Temperature | Tc     | 0    |      | 70   | °C   |

## Electrical Characteristics

| Parameter                              | Symbol                     | Min. | Typ. | Max. | Unit   | Notes                          |
|----------------------------------------|----------------------------|------|------|------|--------|--------------------------------|
| Power Supply Voltage                   | Vcc                        | 3.13 | 3.3  | 3.47 | V      |                                |
| Power Consumption                      |                            |      |      | 3.5  | W      |                                |
| Supply Current                         | ICC                        |      | 0.75 | 1.0  | A      |                                |
| Control I/O Voltage, High              | VIH                        | 2.0  |      | VCC  | V      |                                |
| Control I/O Voltage, Low               | VIL                        | 0    |      | 0.7  | V      |                                |
| Inter-Channel Skew                     | TSK                        |      |      | 150  | ps     |                                |
| RESETL Duration                        |                            |      | 10   |      | us     |                                |
| RESETL De-assert time                  |                            |      |      | 100  | ms     |                                |
| Power on time                          |                            |      |      | 100  | ms     |                                |
| Transmitter                            |                            |      |      |      |        |                                |
| Single Ended Output Voltage Tolerance  |                            | -0.3 |      | 4    | V      |                                |
| AC Common mode Voltage Tolerance (RMS) |                            | 15   |      |      | mV     |                                |
| Tx Input Diff Voltage                  | VI                         | 90   |      | 1600 | mV     |                                |
| Tx Input Diff Impedance                | ZIN                        | 80   | 100  | 120  | Ω      |                                |
| Differential Input Return Loss         | See IEEE 802.3ba 86A.4.11  |      |      |      | dB     | 10MHz-11.1GHz                  |
| J2 Jitter tolerance                    | Jt2                        |      |      | 0.18 | UI     |                                |
| J9 Jitter Tolerance                    | Jt9                        |      |      | 0.26 | UI     |                                |
| Data Dependent Pulse Width Shrinkage   | DDPWS                      |      |      | 0.07 | UI     |                                |
| Eye Mask Coordinates: X1, X2, Y1, Y2   | 0.1, 0.31, 95, 350         |      |      |      |        |                                |
| Receiver                               |                            |      |      |      |        |                                |
| Single Ended Output Voltage Tolerance  |                            | -0.3 |      | 4    | V      | Preferred to TP1 signal common |
| AC Common mode Voltage Tolerance (RMS) |                            |      |      | 7.5  | mV     |                                |
| Termination Mismatch at 1MHz           |                            |      |      | 5    | %      |                                |
| Differential Output Return Loss        | See IEEE 802.3ba 86A.4.2.1 |      |      |      | dB     | 10MHz-11.1GHz                  |
| Common-mode Output Return Loss         | See IEEE 802.3ba 86A.4.2.1 |      |      |      | dB     | 10MHz-11.1GHz                  |
| Rx Output Diff Voltage                 | Vo                         |      | 600  | 800  | mV     |                                |
| Rx Output Rise and Fall Time           | Tr/Tf                      |      |      | 35   | ps     | 20% to 80%                     |
| J2 Jitter Tolerance                    | Jr2                        |      |      | 0.46 | UI     |                                |
| J9 Jitter Tolerance                    | Jr9                        |      |      | 0.63 | UI     |                                |
| Eye Mask Coordinates: X1, X2, Y1, Y2   | 0.29, 0.5, 150, 425        |      |      |      | UI, mV |                                |

**Notes:**

1. The single ended input voltage tolerance is the allowable range of the instantaneous input signals

**Optical Characteristics**

| Parameter                                                                     | Symbol                                                   | Min.   | Typ. | Max.   | Unit  | Notes           |
|-------------------------------------------------------------------------------|----------------------------------------------------------|--------|------|--------|-------|-----------------|
| Wavelength                                                                    | L0                                                       | 1264.5 | 1271 | 1277.5 | nm    |                 |
|                                                                               | L1                                                       | 1284.5 | 1291 | 1297.5 | nm    |                 |
|                                                                               | L2                                                       | 1304.5 | 1311 | 1317.5 | nm    |                 |
|                                                                               | L3                                                       | 1324.5 | 1331 | 1337.5 | nm    |                 |
| <b>Transmitter</b>                                                            |                                                          |        |      |        |       |                 |
| Side-mode Suppression Ratio                                                   | SMSR                                                     | 30     |      |        | dB    |                 |
| Total Average Launch Power                                                    | $P_T$                                                    |        |      | 8.3    | dBm   |                 |
| Average Launch Power, each Lane                                               |                                                          | -7     |      | 2.3    | dBm   |                 |
| Optical Modulation Amplitude, each Lane                                       | OMA                                                      | -4     |      | 3.5    | dBm   |                 |
| Difference in launch Power between any two lanes (OMA)                        |                                                          |        |      | 6.5    | dB    |                 |
| Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane |                                                          | -4.8   |      |        | dBm   |                 |
| TDP, each Lane                                                                | TDP                                                      |        |      | 2.3    | dB    |                 |
| Extinction Ratio                                                              | ER                                                       | 3.5    |      |        | dB    |                 |
| Relative Intensity Noise                                                      | $R_{in}$                                                 |        |      | -128   | dB/Hz | 12dB reflection |
| Optical Return Loss Tolerance                                                 |                                                          |        |      | 20     | dB    |                 |
| Transmitter Reflectance                                                       | $R_T$                                                    |        |      | -12    | dB    |                 |
| Transmitter Eye Mask Definition<br>X1, X2, X3, Y1, Y2, Y3                     | Specification Values<br>0.25, 0.4, 0.45, 0.25, 0.28, 0.4 |        |      |        |       |                 |
| Average Launch Power OFF Transmitter, each Lane                               | $P_{off}$                                                |        |      | -30    | dBm   |                 |
| <b>Receiver</b>                                                               |                                                          |        |      |        |       |                 |
| Damage Threshold                                                              | $TH_d$                                                   | 3.3    |      |        | dBm   | 1               |
| Average Power at receiver Input, each Lane                                    |                                                          | -13.7  |      | 2.3    | dB    |                 |
| Receiver Reflectance                                                          | $R_R$                                                    |        |      | -26    | dB    |                 |
| Receiver Power (OMA), each Lane                                               |                                                          |        |      | 3.5    | dBm   |                 |
| Stressed Receiver Sensitivity in OMA, each Lane                               |                                                          |        |      | -9.9   | dBm   |                 |
| Receiver Sensitivity, each Lane                                               | $S_R$                                                    |        |      | -11.5  | dBm   |                 |
| Difference in Receive Power between any Lanes (OMA)                           |                                                          |        |      | -7.5   | dBm   |                 |
| <b>Condition of Stress Receiver Sensitivity Test</b>                          |                                                          |        |      |        |       |                 |
| Vertical Eye Closure Penalty, each Lane                                       |                                                          |        | 1.6  |        | dB    |                 |
| Stressed Eye Jitter, each Lane                                                |                                                          |        | 0.3  |        | UI    |                 |

**Notes:**

1. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.

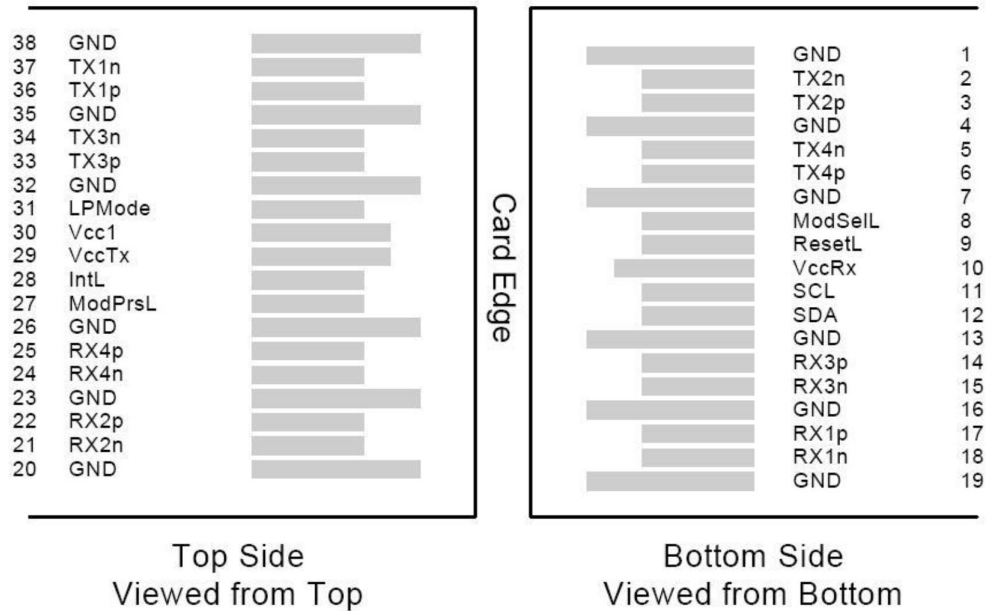
## Pin Descriptions

| Pin | Logic       | Symbol              | Name/Descriptions                                  | Ref. |
|-----|-------------|---------------------|----------------------------------------------------|------|
| 1   |             | GND                 | Module Ground                                      | 1    |
| 2   | CML-I       | Tx2-                | Transmitter inverted data input                    |      |
| 3   | CML-I       | Tx2+                | Transmitter non-inverted data input                |      |
| 4   |             | GND                 | Module Ground                                      | 1    |
| 5   | CML-I       | Tx4-                | Transmitter inverted data input                    |      |
| 6   | CML-I       | Tx4+                | Transmitter non-inverted data input                |      |
| 7   |             | GND                 | Module Ground                                      | 1    |
| 8   | LVTTL-I     | MODSEIL             | Module Select                                      | 2    |
| 9   | LVTTL-I     | ResetL              | Module Reset                                       | 2    |
| 10  |             | VCCR <sub>x</sub>   | +3.3v Receiver Power Supply                        |      |
| 11  | LVC MOS-I   | SCL                 | 2-wire Serial interface clock                      | 2    |
| 12  | LVC MOS-I/O | SDA                 | 2-wire Serial interface data                       | 2    |
| 13  |             | GND                 | Module Ground                                      | 1    |
| 14  | CML-O       | RX3+                | Receiver non-inverted data output                  |      |
| 15  | CML-O       | RX3-                | Receiver inverted data output                      |      |
| 16  |             | GND                 | Module Ground                                      | 1    |
| 17  | CML-O       | RX1+                | Receiver non-inverted data output                  |      |
| 18  | CML-O       | RX1-                | Receiver inverted data output                      |      |
| 19  |             | GND                 | Module Ground                                      | 1    |
| 20  |             | GND                 | Module Ground                                      | 1    |
| 21  | CML-O       | RX2-                | Receiver inverted data output                      |      |
| 22  | CML-O       | RX2+                | Receiver non-inverted data output                  |      |
| 23  |             | GND                 | Module Ground                                      | 1    |
| 24  | CML-O       | RX4-                | Receiver inverted data output                      |      |
| 25  | CML-O       | RX4+                | Receiver non-inverted data output                  |      |
| 26  |             | GND                 | Module Ground                                      | 1    |
| 27  | LVTTL-O     | ModPrsL             | Module Present, internal pulled down to GND        |      |
| 28  | LVTTL-O     | IntL                | Interrupt output should be pulled up on host board | 2    |
| 29  |             | VCCT <sub>x</sub>   | +3.3v Transmitter Power Supply                     |      |
| 30  |             | VCC1                | +3.3v Power Supply                                 |      |
| 31  | LVTTL-I     | LPM <sub>Mode</sub> | Low Power Mode                                     | 2    |
| 32  |             | GND                 | Module Ground                                      | 1    |
| 33  | CML-I       | Tx3+                | Transmitter non-inverted data input                |      |
| 34  | CML-I       | Tx3-                | Transmitter inverted data input                    |      |
| 35  |             | GND                 | Module Ground                                      | 1    |
| 36  | CML-I       | Tx1+                | Transmitter non-inverted data input                |      |
| 37  | CML-I       | Tx1-                | Transmitter inverted data input                    |      |
| 38  |             | GND                 | Module Ground                                      | 1    |

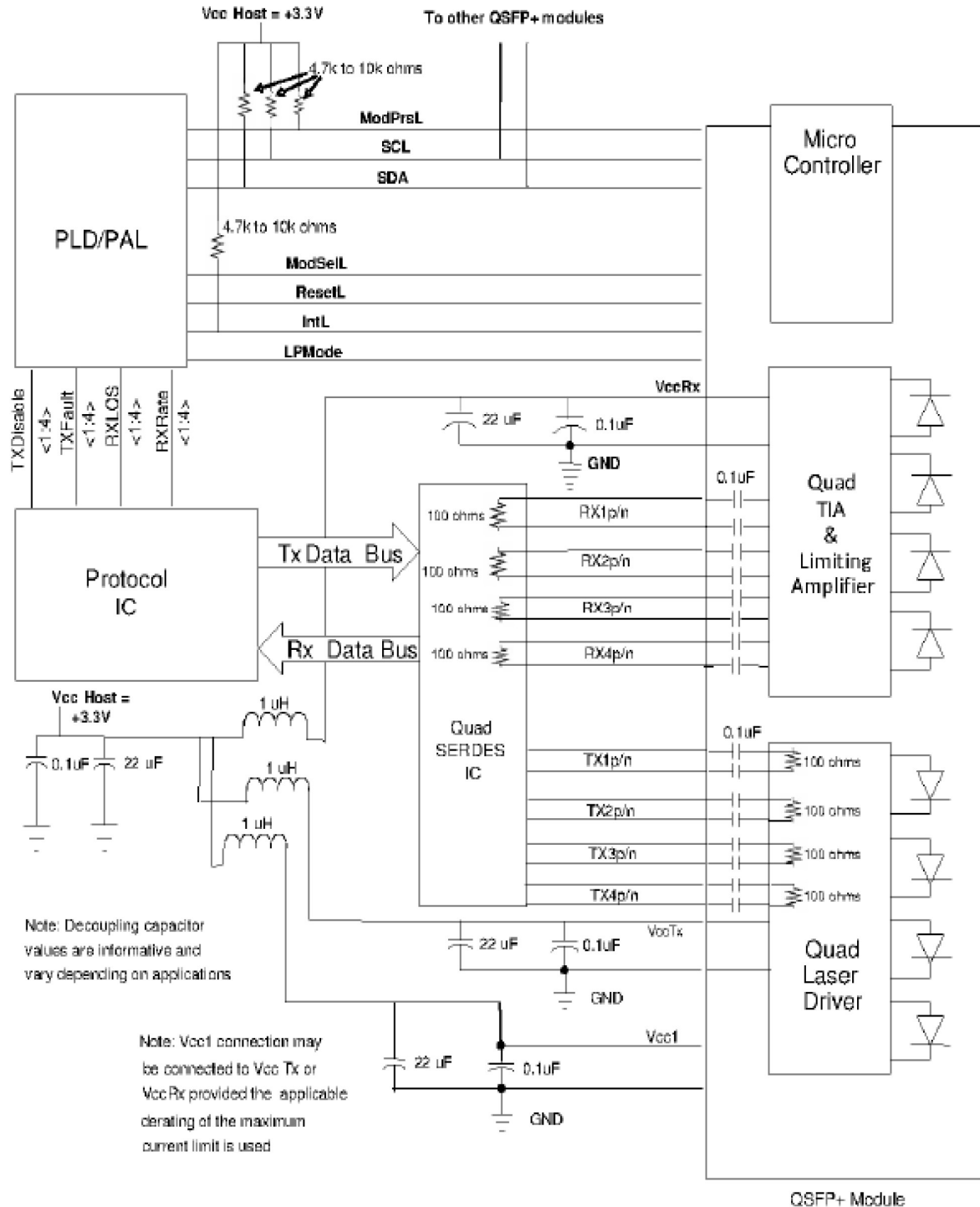
**Notes:**

- 1. Module circuit ground is isolated from module chassis ground with in the module.
- 2. Open collector; should be pulled up with 4.7k-10k ohms on host board to a voltage between 3.15V and 3.6V.

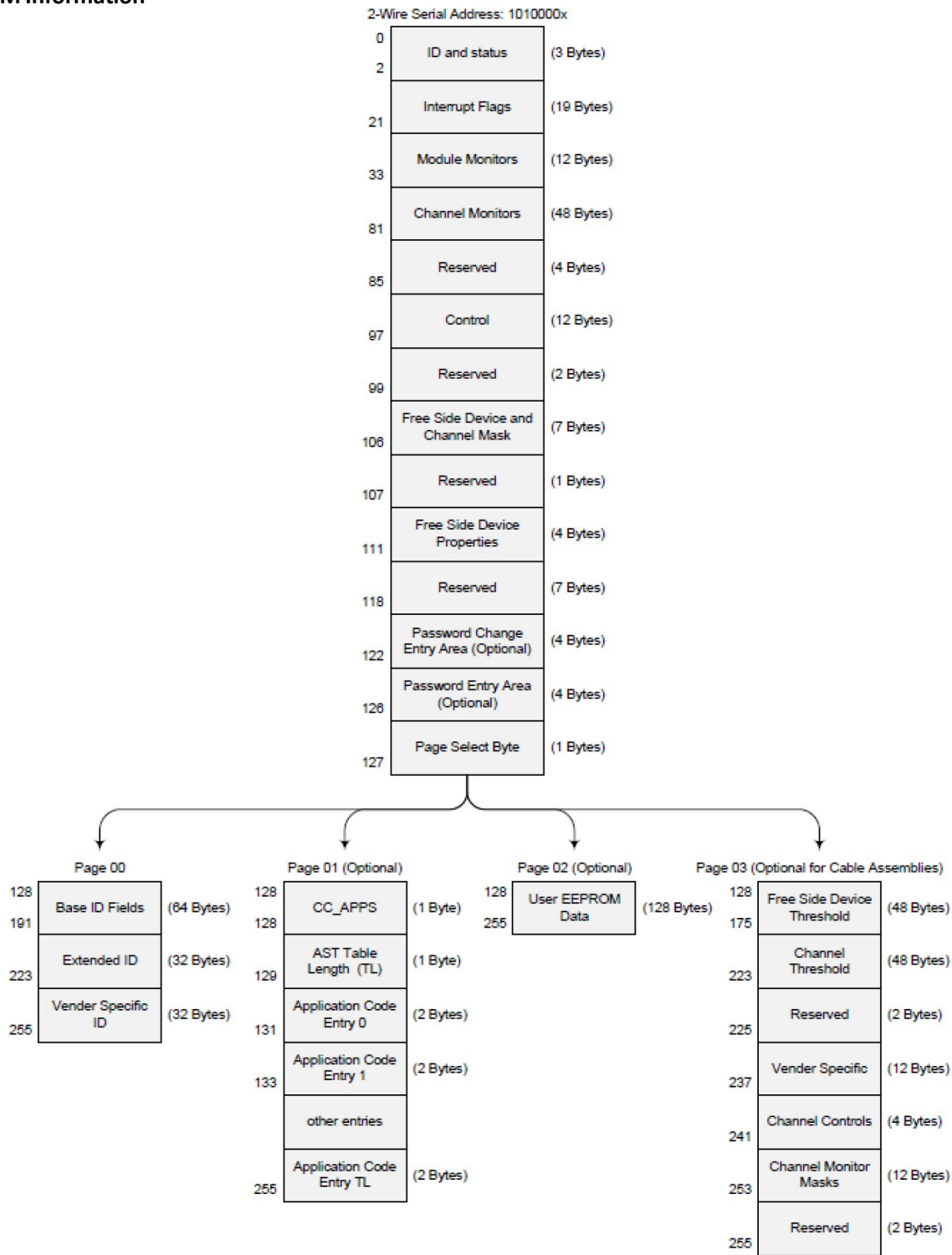
**Electrical Pin-out Details**



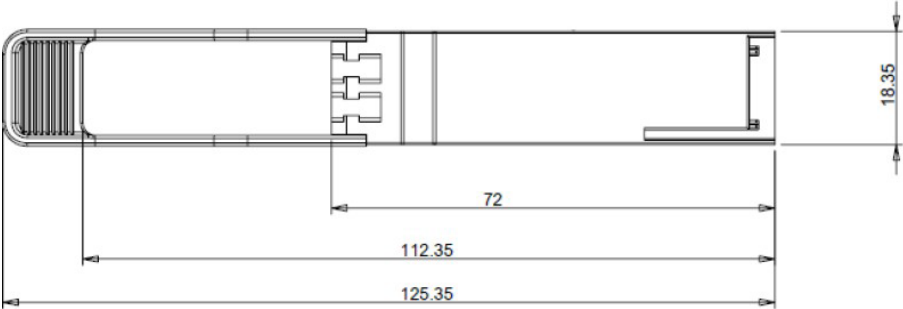
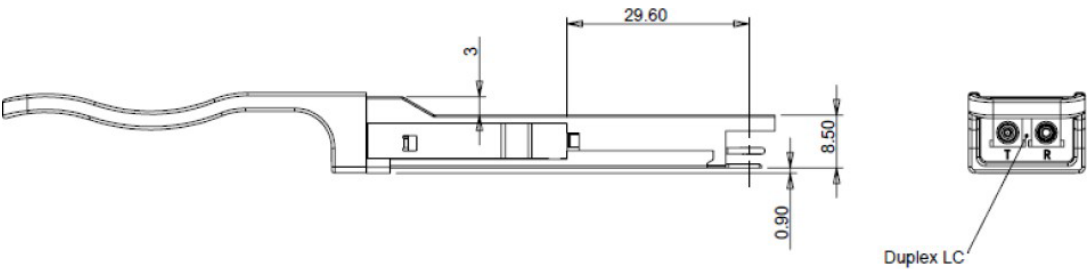
## Recommended Circuit Schematic



EEPROM Information



Mechanical Specifications





# 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.

