

## S2813040252F000

MSA 25GBase-ER SFP28 Transceiver (SMF, 1310nm, 40km, LC, DOM, -40 to 85C)

### Product Description

This MSA Compliant SFP28 transceiver provides 25GBase-ER throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1310nm via 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. 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-8432 and SFF-8472 Compliance
- Duplex LC Connector
- Industrial Temperature -40 to 85 Celsius
- Single-mode Fiber
- Hot Pluggable
- Excellent ESD Protection
- Metal with Lower EMI
- RoHS Compliant and Lead Free



### Applications:

- 25GBase-ER Ethernet
- Access, Metro 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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### 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. | Typ.           | Max.               | Unit | Notes |
|-------------------------------------------------|--------|------|----------------|--------------------|------|-------|
| Maximum Supply Voltage                          | Vcc    | -0.5 |                | 4.0                | V    |       |
| Storage Temperature                             | TS     | -40  |                | 85                 | °C   |       |
| Operating Case Temperature                      | Tc     | -40  | 25             | 85                 | °C   |       |
| Operating Humidity                              | RH     | 5    |                | 95                 | %    |       |
| Receiver Power                                  | Rmax   |      |                | -4                 | dBm  |       |
| Data Rate                                       |        |      | 24.33<br>25.78 |                    | Gbps |       |
| Bit Error Rate                                  | BER    |      |                | $5 \times 10^{-5}$ |      | 1     |
| Supported Link Length on 9/125um SMF, 25.78Gb/s | L      |      | 40             |                    | km   | 2     |

### Notes:

1. Tested with a PRBS 2<sup>31</sup>-1 test pattern for 25.78Gb/s operation.
2. Distances are based on FC-PI-6 Rev. 3.1 and IEEE 802.3 standards.

## Electrical Characteristics

| Parameter                        |                      | Symbol                          | Min.  | Typ. | Max.    | Unit  | Notes |
|----------------------------------|----------------------|---------------------------------|-------|------|---------|-------|-------|
| Power Supply Voltage             |                      | V <sub>cc</sub>                 | 3.135 | 3.30 | 3.465   | V     |       |
| Power Supply Current             |                      | I <sub>cc</sub>                 |       |      | 545     | mA    |       |
| Power Dissipation                |                      | PD                              |       |      | 1800    | mW    |       |
| Transmitter                      |                      |                                 |       |      |         |       |       |
| Differential data input swing    |                      | V <sub>in,pp</sub>              | 180   |      | 700     | mVp-p |       |
| Input differential impedance     |                      | Z <sub>in</sub>                 |       | 100  |         | Ω     |       |
| TX_FAULT                         | Transmitter Fault    | VOH                             | 2.0   |      | VCCHOST | V     |       |
|                                  | Normal Operation     | VOL                             | 0     |      | 0.8     | V     |       |
| TX_DISABLE                       | Transmitter Disable  | VIH                             | 2.0   |      | VCCHOST | V     |       |
|                                  | Transmitter Enable   | VIL                             | 0     |      | 0.8     | V     |       |
| Receiver                         |                      |                                 |       |      |         |       |       |
| Differential data output swing   |                      | V <sub>out, pp</sub>            | 300   |      | 850     | mVp-p | 1     |
| Output differential impedance    |                      | Z <sub>o</sub>                  |       | 100  |         | Ω     |       |
| Data Output Rise Time, Fall Time |                      | t <sub>r</sub> , t <sub>f</sub> | 15    |      |         | ps    | 2     |
| RX_LOS                           | Loss of signal (LOS) | VOH                             | 2.0   |      | VCCHOST | V     | 3     |
|                                  | Normal Operation     | VOL                             | 0     |      | 0.8     | V     | 3     |

### Notes:

1. Internally AC coupled but requires an external 100Ω differential load termination.
2. 20 – 80 %.
3. LOS is an open collector output. Should be pulled up with 4.7kΩ on the host board.

## Optical Characteristics

| Parameter                                                                                        | Symbol           | Min.                               | Typ. | Max. | Unit  | Notes |
|--------------------------------------------------------------------------------------------------|------------------|------------------------------------|------|------|-------|-------|
| Transmitter                                                                                      |                  |                                    |      |      |       |       |
| Launch Optical Power (average)                                                                   | Pavg             | 0                                  |      | +6   | dBm   | 1     |
| Extinction Ratio                                                                                 | ER               | 4.0                                |      |      | dB    |       |
| Center Wavelength Range                                                                          | λc               | 1295                               |      | 1310 | nm    |       |
| Transmitter and Dispersion Penalty                                                               | TDP              |                                    |      | 2.7  | dB    |       |
| Spectral Width                                                                                   | Δλ               |                                    |      | 1    | nm    | 2     |
| RIN20OMA (max)                                                                                   | RIN              |                                    |      | -130 | dB/Hz |       |
| Optical Return Loss Tolerance                                                                    | ORLT             |                                    |      | 20   | dB    |       |
| Pout @TX-Disable Asserted                                                                        | Poff             |                                    |      | -30  | dBm   |       |
| Transmitter eye mask definition<br>{X1, X2, X3, Y1, Y2, Y3}<br>Hit ratio 5×10-5 hits per sample. |                  | {0.31, 0.4, 0.45, 0.34, 0.38, 0.4} |      |      |       |       |
| Receiver                                                                                         |                  |                                    |      |      |       |       |
| Center Wavelength                                                                                | λc               | 1295                               | 1310 | 1325 | nm    |       |
| Receiver Sensitivity(average)                                                                    | RxSENS1          |                                    |      | -21  | dBm   | 3     |
| Receiver Sensitivity (OMA)                                                                       | RxSENS2          |                                    |      | -19  | dBm   | 3     |
| Receiver Overload                                                                                | POL              | -4                                 |      |      | dBm   |       |
| Optical Return Loss                                                                              | ORL              | 26                                 |      |      | dB    |       |
| LOS De-Assert                                                                                    | LOS <sub>D</sub> |                                    |      | -21  | dBm   |       |
| LOS Assert                                                                                       | LOS <sub>A</sub> | -35                                |      |      | dBm   |       |
| LOS Hysteresis                                                                                   |                  | 0.5                                |      |      | dB    |       |

### Notes:

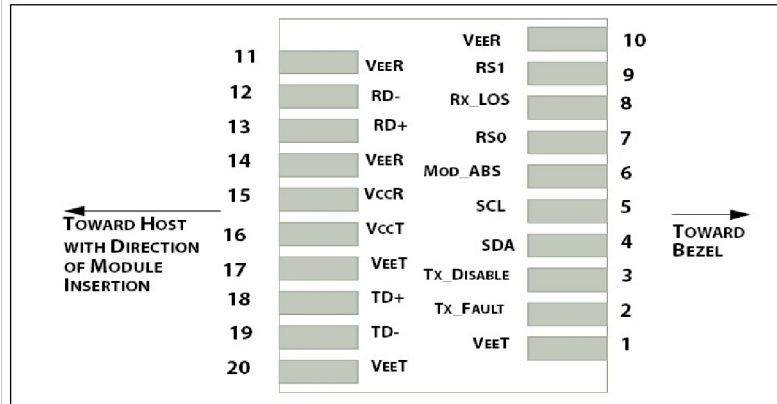
1. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
2. 20dB spectral width.
3. Measured @25.78Gbps, with PRBS  $2^{31}-1$  at  $5 \times 10^{-5}$  BER.

## Pin Description

| PIN | Symbol     | Name / Description                                                     | Notes |
|-----|------------|------------------------------------------------------------------------|-------|
| 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        | Two wire serial interface Data Line (LVCMOS-I/O) (MOD-DEF2)            | 4     |
| 5   | SCL        | Two wire serial interface Clock Line (LVCMOS-I/O) (MOD-DEF1)           | 4     |
| 6   | MOD_ABS    | Module Absent (Output), connected to VeeT or VeeR in the module        | 5     |
| 7   | RS0        | NA                                                                     | 6     |
| 8   | RX_LOS     | Receiver Loss of Signal (LVTTTL-O)                                     | 2     |
| 9   | RS1        | NA                                                                     | 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                                                        | 1     |
| 15  | VccR       | Receiver Power - +3.3V                                                 |       |
| 16  | VccT       | Transmitter Power - +3.3 V                                             |       |
| 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     |

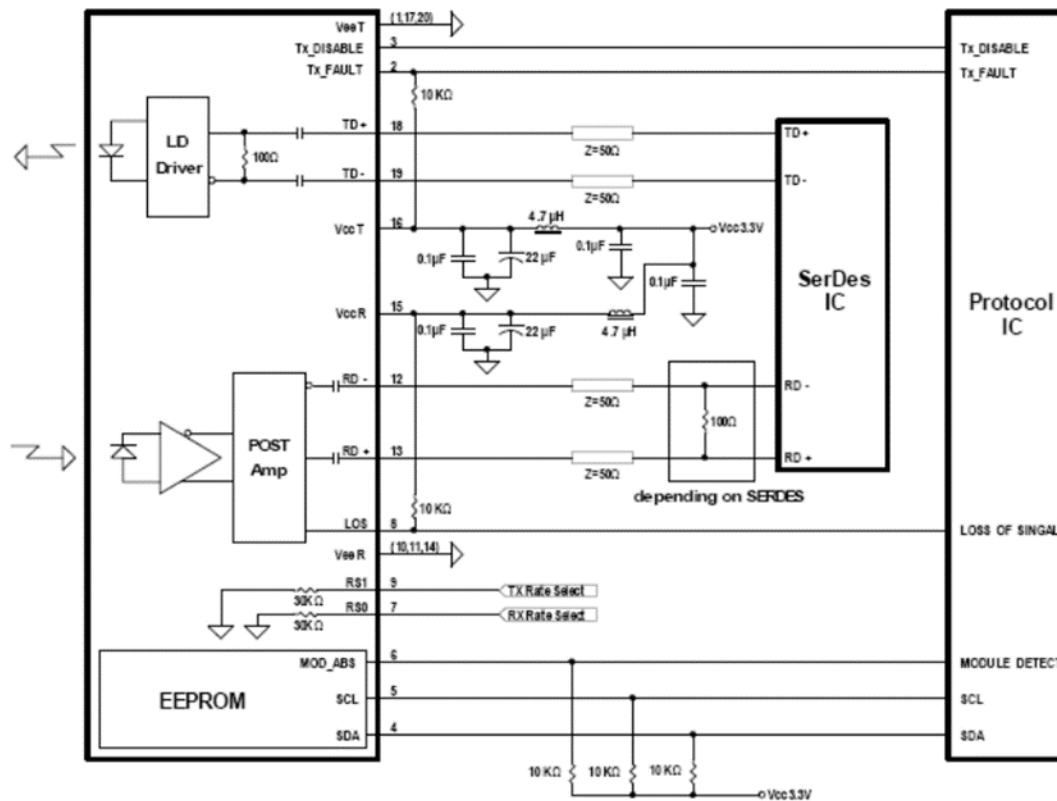
## Notes:

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 VccHost.
3. This input is internally biased high with a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccT.
4. Two-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 VccHost.
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, Address A2h. Tx Rate Select is set at Bit 3, Byte 118, 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.



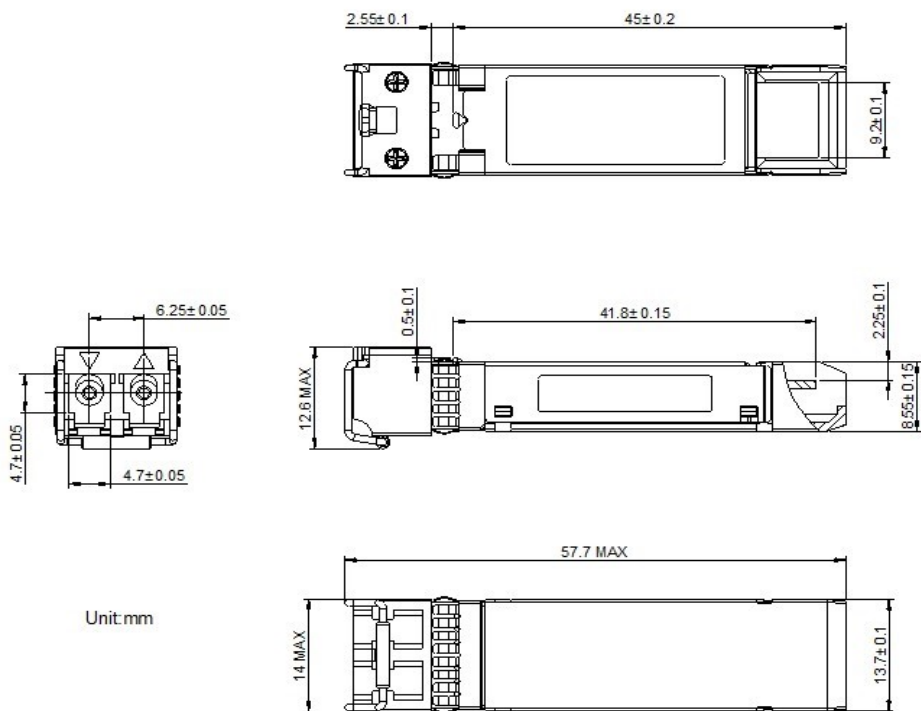
Pin-out of connector Block on Host board

### Recommended Circuit Schematic



Mechanical Specifications

Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).



EEPROM Information

EEPROM memory map specific data field description is as below:

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

# 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.

