



## SBU35020GE3B221

HP® Compatible 1000Base-BX SFP Transceiver (SMF, 1310nmTx/1550nmRx, 20km, SC, DOM)

### Product Description

This HP® compatible SFP transceiver provides 1000Base-BX throughput up to 20km over single-mode fiber (SMF) using a wavelength of 1310nmTx/1550nmRx via an SC connector. This bidirectional unit must be used with another transceiver or network appliance of complementing wavelengths. 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 HP®. 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:

- INF-8074 and SFF-8472 Compliance
- Simplex SC 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:

- 1000Base-BX Ethernet
- Access (FTTx) 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 |      | 3.6  | V    |       |
| Storage Temperature        | T <sub>stg</sub> | -40  |      | 85   | °C   |       |
| Operating Case Temperature | T <sub>c</sub>   | 0    |      | 70   | °C   |       |
| Relative Humidity          | RH               | 5    |      | 85   | %    |       |
| Power Supply Current       | I <sub>cc</sub>  |      |      | 300  | mA   |       |

## Electrical Characteristics

| Parameter                     |                      | Symbol | Min. | Typ.  | Max.    | Unit  | Notes |
|-------------------------------|----------------------|--------|------|-------|---------|-------|-------|
| Supply Voltage                |                      | Vcc    | 3.15 | 3.3   | 3.47    | V     |       |
| 9μm Core Diameter SMF         |                      | L      |      | 20    |         | km    |       |
| Data Rate                     | GBE                  |        |      | 1.25  |         | Gbps  |       |
|                               | FC                   |        |      | 1.063 |         |       |       |
| Transmitter                   |                      |        |      |       |         |       |       |
| LVPECL Differential Inputs    |                      | VIN    | 400  |       | 1800    | mVp-p | 1     |
| Input Differential Impedance  |                      | ZIN    | 90   | 100   | 110     | Ω     | 2     |
| Tx_Disable                    | Disable              |        | 2    |       | Vcc+0.3 | V     |       |
|                               | Enable               |        | 0    |       | 0.8     | V     |       |
| Tx_Fault                      | Fault                |        | 2    |       | Vcc+0.3 | V     |       |
|                               | Normal               |        | 0    |       | 0.8     | V     |       |
| Receiver                      |                      |        |      |       |         |       |       |
| LVPECL Differential Outputs   |                      | VOUT   | 400  |       | 2000    | mVp-p | 3     |
| Output Differential Impedance |                      | ZOUT   | 90   | 100   | 110     | Ω     |       |
| Tx_Disable Assert Time        |                      | T_off  |      |       | 10      | us    |       |
| Rx_LOS                        | Loss of Signal (LOS) |        | 2    |       | Vcc+0.3 | V     |       |
|                               | Normal Operation     |        | 0    |       | 0.8     | V     |       |
| MOD_DEF(0.2)                  |                      | VOH    | 2.5  |       | Vcc+0.3 | V     | 4     |
|                               |                      | VOL    | 0    |       | 0.5     | V     |       |

## Notes:

1. AC coupled inputs. LVPECL logic. Internal AC coupling.
2. R<sub>IN</sub> > 100kΩ @ DC.
3. AC coupled outputs. LVPECL logic. Internal AC coupling.
4. With serial ID.

## Optical Characteristics

| Parameter                  | Symbol                    | Min. | Typ. | Max. | Unit | Notes |
|----------------------------|---------------------------|------|------|------|------|-------|
| Transmitter                |                           |      |      |      |      |       |
| Center Wavelength          | $\lambda_C$               | 1290 | 1310 | 1330 | nm   |       |
| Spectral Width (RMS)       | $\Delta\lambda$           |      |      | 4    | nm   |       |
| Average Output Power       | POUT                      | -9   |      | -3   | dBm  | 1     |
| Extinction Ratio           | ER                        | 9    |      |      | dB   |       |
| Rise/Fall Time (20-80%)    | Tr/Tf                     |      |      | 0.26 | ns   |       |
| POUT @ Tx_Disable Asserted | POUT                      |      |      | -35  | dBm  |       |
| Output Optical Eye         | Compliant with IEEE 802.3 |      |      |      |      | 2     |
| Receiver                   |                           |      |      |      |      |       |
| Center Wavelength          | $\lambda_C$               | 1530 | 1550 | 1570 | nm   |       |
| Receiver Sensitivity       | Pmin                      |      |      | -24  | dBm  | 3     |
| Receiver Overload          | Pmax                      | -3   |      |      | dBm  |       |
| LOS De-Assert              | LOSD                      |      |      | -25  | dBm  |       |
| LOS Assert                 | LOSA                      | -35  |      |      | dBm  |       |
| LOS Hysteresis             |                           | 1    |      | 4    | dB   |       |

### Notes:

1. Output power is measured by coupling into a 9/125 $\mu$ m single-mode fiber.
2. Filtered. Measured with a PRBS  $2^7-1$  test pattern @1250Mbps.
3. Minimum average optical power is measured at BER less than  $1E^{-12}$  with  $2^7-1$  PRBS and ER=9dB.

## Pin Descriptions

| Pin | Symbol      | Name/Description                                          | Plug Seq. | Note                   |
|-----|-------------|-----------------------------------------------------------|-----------|------------------------|
| 1   | VeeT        | Transmitter Ground.                                       | 1         | 5                      |
| 2   | Tx_Fault    | Transmitter Fault Indication.                             | 3         | 1                      |
| 3   | Tx_Disable  | Transmitter Disable. Module disables on "high" or "open." | 3         | 2                      |
| 4   | MOD_DEF2    | Module Definition 2. 2-Wire Serial ID Interface.          | 3         | 3                      |
| 5   | MOD_DEF1    | Module Definition 1. 2-Wire Serial ID Interface.          | 3         | 3                      |
| 6   | MOD_DEF0    | Module Definition 0. 2-Wire Serial ID Interface.          | 3         | 3                      |
| 7   | Rate Select | Not Connected.                                            | 3         | Function Not Available |
| 8   | LOS         | Loss of Signal.                                           | 3         | 4                      |
| 9   | VeeR        | Receiver Ground.                                          | 1         | 5                      |
| 10  | VeeR        | Receiver Ground.                                          | 1         | 5                      |
| 11  | VeeR        | Receiver Ground.                                          | 1         | 5                      |
| 12  | RD-         | Inverse Received Data Out.                                | 3         | 6                      |
| 13  | RD+         | Received Data Out.                                        | 3         | 7                      |
| 14  | VeeR        | Receiver Ground.                                          | 1         | 5                      |
| 15  | VccR        | 3.3 ± 5% Receiver Power.                                  | 2         | 7                      |
| 16  | VccT        | 3.3 ± 5% Transmitter Power.                               | 2         | 7                      |
| 17  | VeeT        | Transmitter Ground.                                       | 1         | 5                      |
| 18  | TD+         | Transmitter Data In.                                      | 3         | 8                      |
| 19  | TD-         | Inverse Transmitter Data In.                              | 3         | 8                      |
| 20  | VeeT        | Transmitter Ground.                                       | 1         | 5                      |

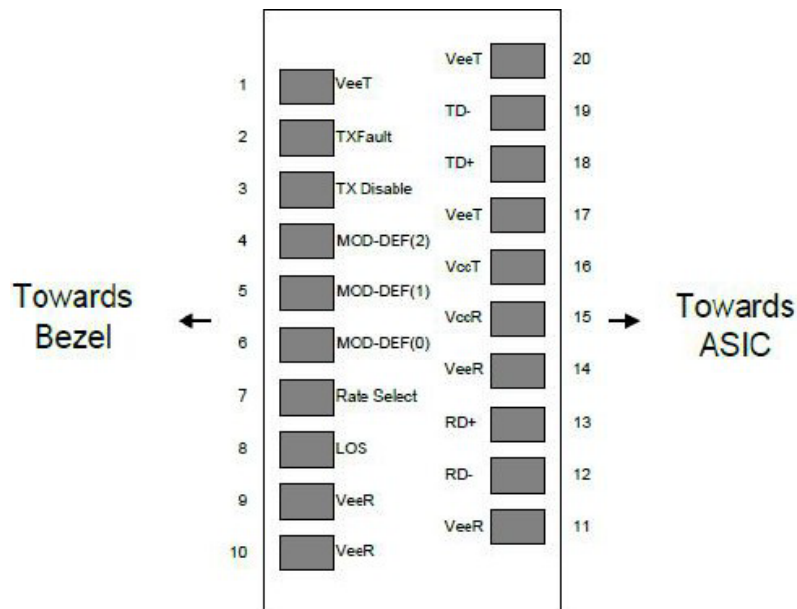
## Notes:

1. Tx\_Fault is an open collector/drain output that should be pulled up with a 4.7kΩ to 10kΩ resistor on the host board. Pull-up voltage between 2.0V and VccT/R+0.3V. When "high," output indicates a laser fault of some kind. "Low" indicates normal operation. In the "low" state, the output will be pulled to <0.8V.
2. Tx\_Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7kΩ to 10kΩ resistor. Its states are:
  - Low (0V–0.8V): Transmitter On.
  - (>0.8, <2.0V): Undefined.
  - High (2.0V–3.465V): Transmitter Disabled.
  - Open: Transmitter Disabled.
3. MOD\_DEF0, 1, and 2. These are the module definition pins. They should be pulled up with a 4.7kΩ to 10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.
  - MOD\_DEF0 is grounded by the module to indicate that the module is present.
  - MOD\_DEF1 is the clock line of the 2-wire serial interface for serial ID.

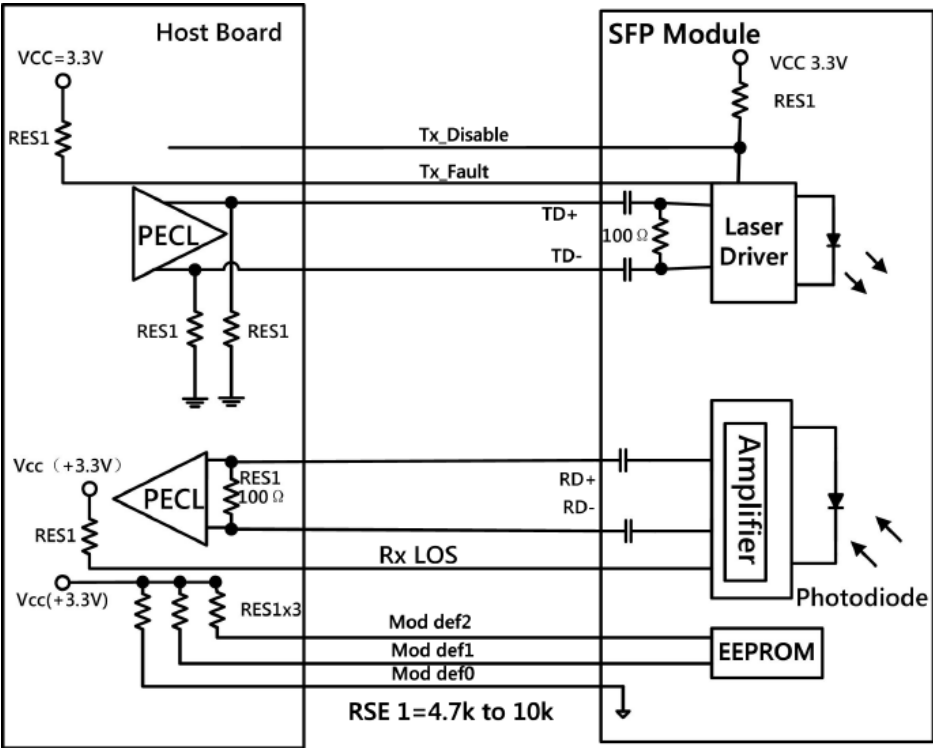
MOD-DEF 2 is the data line of the 2-wire serial interface for serial ID.

4. LOS (Loss of Signal) is an open collector/drain output that should be pulled up with a 4.7k $\Omega$  to 10k $\Omega$  resistor. Pull-up voltage between 2.0V and VccT/R+0.3V. When “high,” this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). “Low” indicates normal operation. In the “low” state, the output will be pulled to <0.8V.
5. VeeR and VeeT may be internally connected within the SFP module.
6. RD-/+. These are the differential receiver outputs. They are AC coupled 100k $\Omega$  (differential) lines that should be terminated with 100k $\Omega$  (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 400mV and 2000mV differential (200mV –1000mV single-ended) when properly terminated.
7. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V $\pm$ 5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1k $\Omega$  should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot-plugging of the SFP transceiver module will result in an in-rush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.
8. TD-/+. These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 differential terminations inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 400mV-2000mV (200mV – 1000mV single-ended).

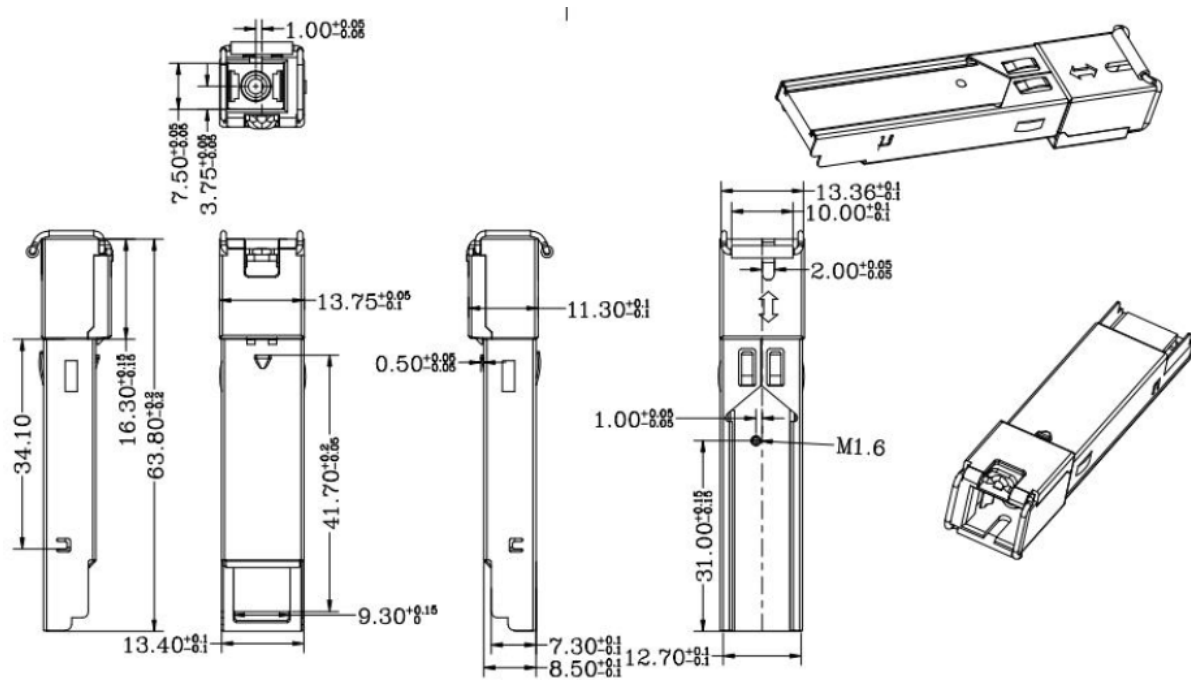
## Electrical Pin-Out Details



Recommended Application Interface Block Diagram



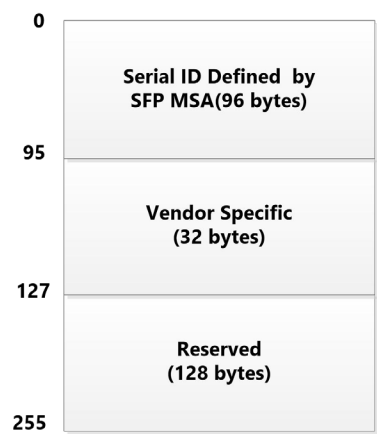
Mechanical Specifications



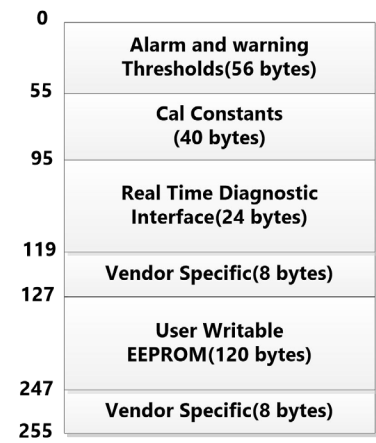
**EEPROM Information**

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially. The module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map-specific data field define as following. For detailed EEPROM information please refer to the related document of SFF8472 Rev 10.2.

**2 wire address 1010000X(A0h)**



**2 wire address 1010000X (A2h)**



# 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.

