

# HTXFB-2396-10BD

## 10Gb/s BIDI XFP 10km Transceiver

### PRODUCT FEATURES

- Hot-pluggable XFP footprint
- Supports 9.95Gb/s to 11.3Gb/s bit rates
- XFI Loopback Mode
- RoHS-6 Compliant (lead-free)
- 1270nm DFB laser and PIN receiver for HTXFB-2396-10BD-10D  
1330nm DFB laser and PIN receiver for XFBL-332796-10D
- Power dissipation<2W
- Case operating temperature:0 °C~70°C
- Single + 3.3V Power Supply
- Up to 10km transmission on SMF
- 2-wire interface with integrated Digital Diagnostic monitoring
- EEPROM with Serial ID Functionality
- Compliant with XFP MSA with LC connector

### APPLICATIONS

- 10GBASE-BX 10.3125Gb/s Ethernet
- 10GBASE-BX 9.953Gb/s Ethernet
- SONET OC-192 SR-1 SDH STM I-64.1

### PRODUCT DESCRIPTION

HTXFB-2396-10BD is hot pluggable 3.3V Small-Form-Factor transceiver module. It designed expressly for high-speed communication applications that require rates up to 11.3Gb/s, it designed to be compliant with XFP MSA. The module data link up to 10km in 9/125um single mode fiber.

## I . Absolute Maximum Ratings

| Parameter            | Symbol | Min.                 | Typ. | Max.                 | Unit | Note |
|----------------------|--------|----------------------|------|----------------------|------|------|
| Storage Temperature  | Ts     | -40                  | -    | 85                   | °C   |      |
| Relative Humidity    | RH     | 5                    | -    | 95                   | %    |      |
| Power Supply Voltage | VCC    | -0.3                 | -    | 4                    | V    |      |
| Signal Input Voltage | VCC    | V <sub>cc</sub> -0.3 | -    | V <sub>cc</sub> +0.3 | V    |      |

## II. Recommended Operating Conditions

| Parameter                  | Symbol            | Min. | Typ.    | Max. | Unit | Note             |
|----------------------------|-------------------|------|---------|------|------|------------------|
| Case Operating Temperature | T <sub>case</sub> | 0    | -       | 70   | °C   | Without air flow |
| Power Supply Voltage       | VCC               | 3.14 | 3.3     | 3.47 | V    |                  |
| Power Supply Current       | ICC               | -    | -       | 600  | mA   |                  |
| Data Rate                  | BR                | 9.95 | 10.3125 | 11.3 | Gbps |                  |
| Transmission Distance      | TD                |      | -       | 10   | km   |                  |
| Coupled fiber              | Single mode fiber |      |         |      |      | SMF              |

## III. Optical Characteristics

| Parameter                               | Symbol                      | Min. | Typ. | Max. | Unit | Note                |
|---|-----------------------------|------|------|------|------|---------------------|
| <b>Transmitter</b>                      |                             |      |      |      |      |                     |
| Average Launched Power                  | P <sub>out</sub>            | -5   | -    | 0    | dBm  |                     |
| Average Launch power of OFF transmitter | P <sub>OFF</sub>            | -    | -    | -30  | dBm  | Note (1)            |
| Center Wavelength Range                 | $\lambda_C$                 | 1260 | 1270 | 1280 | nm   | HTXFB-2396-10BD-10D |
|   |                             | 1320 | 1330 | 1340 | nm   | XFBL-332796-10D     |
| Side mode suppression ratio             | SMSR                        | 30   | -    | -    | dB   |                     |
| Spectrum Bandwidth(-20dB)               | $\sigma$                    | -    | -    | 1    | nm   |                     |
| Extinction Ratio                        | ER                          | 3.5  |      | -    | dB   | Note (2)            |
| Output Eye Mask                         | Compliant with IEEE 802.3ae |      |      |      |      | Note (2)            |
| <b>Receiver</b>                         |                             |      |      |      |      |                     |
| Input Optical Wavelength                | $\lambda_{IN}$              | 1320 | 1330 | 1340 | nm   | HTXFB-2396-10BD-10D |
|   |                             | 1260 | 1270 | 1280 | nm   | XFBL-332796-10D     |
| Receiver Sensitivity                    | P <sub>sen</sub>            | -    | -    | -15  | dBm  | Note (3)            |
| Input Saturation Power (Overload)       | P <sub>SAT</sub>            | 0.5  | -    | -    | dBm  | Note (3)            |
| LOS -Assert Power                       | PA                          | -32  | -    | -    | dBm  |                     |
| LOS -Deassert Power                     | PD                          | -    | -    | -18  | dBm  |                     |
| LOS -Hysteresis                         | PHys                        | 0.5  | -    | 4    | dB   |                     |

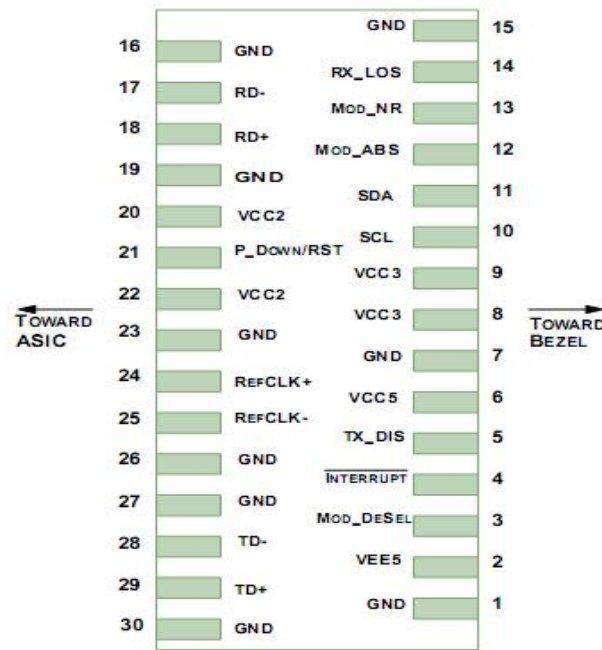
Note :

- The optical power is launched into SMF
- Measured with RPBS 2<sup>31</sup>-1 test pattern @10.3125Gbs
- Measured with RPBS 2<sup>31</sup>-1 test pattern @10.3125Gbs BER=<10<sup>-12</sup>

## IV. Electrical Interface Characteristics

| Parameter                          | Symbol  | Min. | Typ. | Max.    | Unit  | Note |
|------------------------------------|---------|------|------|---------|-------|------|
| Total power supply current         | Icc     | -    | -    | 600     | mA    |      |
| <b>Transmitter</b>                 |         |      |      |         |       |      |
| Differential Data Input Voltage    | VDT     | 120  | -    | 820     | mVp-p |      |
| Differential line input Impedance  | RIN     | 85   | 100  | 115     | Ohm   |      |
| Transmitter Fault Output-High      | VFaultH | 2.4  | -    | Vcc     | V     |      |
| Transmitter Fault Output-Low       | VFaultL | -0.3 | -    | 0.8     | V     |      |
| Transmitter Disable Voltage- High  | VDisH   | 2    | -    | Vcc+0.3 | V     |      |
| Transmitter Disable Voltage- low   | VDisL   | -0.3 | -    | 0.8     | V     |      |
| <b>Receiver</b>                    |         |      |      |         |       |      |
| Differential Data Output Voltage   | VDR     | 300  | -    | 850     | mVp-p |      |
| Differential line Output Impedance | ROUT    | 80   | 100  | 120     | Ohm   |      |
| Receiver LOS Pull up Resistor      | RLOS    | 4.7  | -    | 10      | KOhm  |      |
| Data Output Rise/Fall time         | tr/tf   | 20   | -    | -       | ps    |      |
| LOS Output Voltage-High            | VLOSH   | 2    | -    | Vcc     | V     |      |
| LOS Output Voltage-Low             | VLOSL   | -0.3 | -    | 0.4     | V     |      |

## V. Pin Assignment



**Diagram of Host Board Connector Block Pin Numbers and Name**

| Pin | Logic    | Symbol     | Name/Description   | Note |
|-----|----------|------------|--|------|
| 1   |          | GND        | Module Ground  | 1    |
| 2   |          | VEE5       | Optional -5.2 Power Supply – <b>Not required</b>   |      |
| 3   | LVTTL-I  | Mod-Desel  | Module De-select; When held low allows the module to respond to 2-wire serial interface commands                                     |      |
| 4   | LVTTL-O  | Interrupt  | Interrupt (bar); Indicates presence of an important condition which can be read over the serial 2-wire interface                     | 2    |
| 5   | LVTTL-I  | TX_DIS     | Transmitter Disable; Transmitter laser source turned off   |      |
| 6   |          | VCC5       | +5 Power Supply  |      |
| 7   |          | GND        | Module Ground  | 1    |
| 8   |          | VCC3       | +3.3V Power Supply   |      |
| 9   |          | VCC3       | +3.3V Power Supply   |      |
| 10  | LVTTL-I  | SCL        | Serial 2-wire interface clock  | 2    |
| 11  | LVTTLI/O | SDA        | Serial 2-wire interface data line  | 2    |
| 12  | LVTTL-O  | Mod_Abs    | Module Absent; Indicates module is not present. Grounded in the module.  | 2    |
| 13  | LVTTL-O  | Mod_NR     | Module Not Ready; Hirundo defines it as a logical OR between RX_LOS and Loss of Lock in TX/RX.                                       | 2    |
| 14  | LVTTL-O  | RX_LOS     | Receiver Loss of Signal indicator  | 2    |
| 15  |          | GND        | Module Ground  | 1    |
| 16  |          | GND        | Module Ground  | 1    |
| 17  | CML-O    | RD-        | Receiver inverted data output  |      |
| 18  | CML-O    | RD+        | Receiver non-inverted data output  |      |
| 19  |          | GND        | Module Ground  | 1    |
| 20  |          | VCC2       | +1.8V Power Supply – <b>Not required</b>   |      |
| 21  | LVTTL-I  | P_Down/RST | Power Down; When high, places the module in the low power stand-by mode and on the falling edge of P_Down initiates a module reset   |      |
|     |          |            | Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle. |      |
| 22  |          | VCC2       | +1.8V Power Supply – <b>Not required</b>   |      |
| 23  |          | GND        | Module Ground  | 1    |

|    |        |         |   |   |
|----|--------|---------|---|---|
| 24 | PECL-I | RefCLK+ | Reference Clock non-inverted input, AC coupled on the host board –<br><b>Not required</b> | 3 |
| 25 | PECL-I | RefCLK- | Reference Clock inverted input, AC coupled on the host board – <b>Not required</b>        | 3 |
| 26 |        | GND     | Module Ground   | 1 |
| 27 |        | GND     | Module Ground   | 1 |
| 28 | CML-I  | TD-     | Transmitter inverted data input   |   |
| 29 | CML-I  | TD+     | Transmitter non-inverted data input   |   |
| 30 |        | GND     | Module Ground   | 1 |

**Notes:**

1. Module circuit ground is isolated from module chassis ground within the module.
2. Open collector; should be pulled up with 4.7k – 10kohms on host board to a voltage between 3.15V and 3.6V.
3. A Reference Clock input is not required by the HTXFB-2396-10BD. If present, it will be ignored.

## VI. Digital Diagnostic Functions

As defined by the XFP MSA, Hirundo XFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

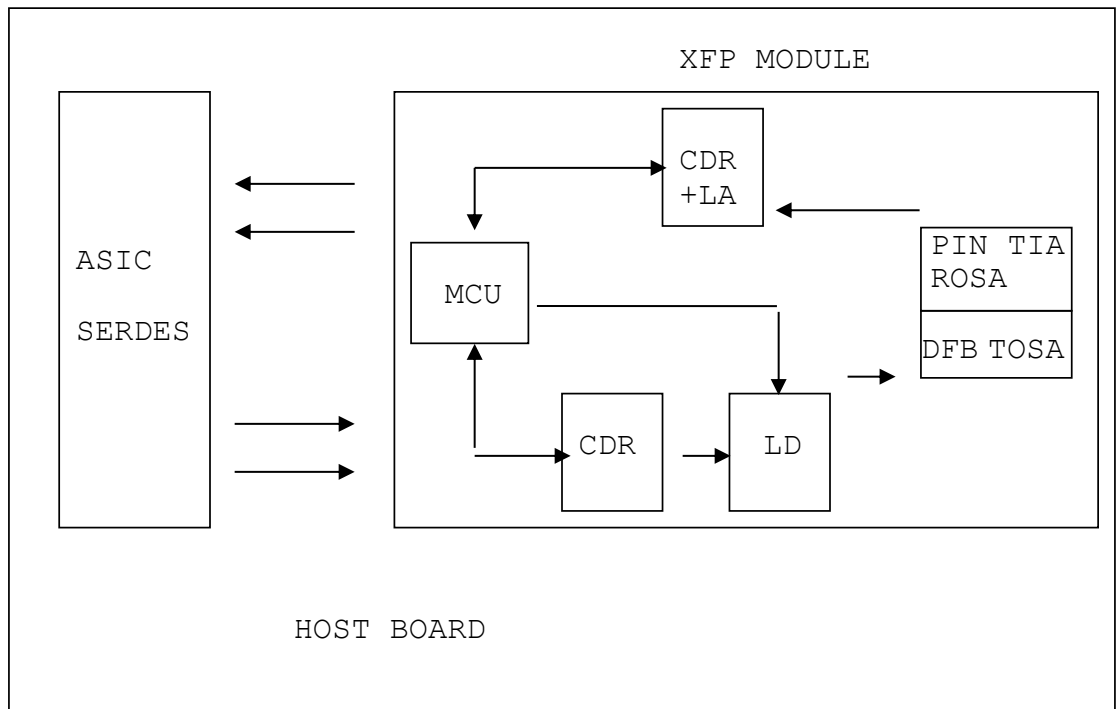
- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

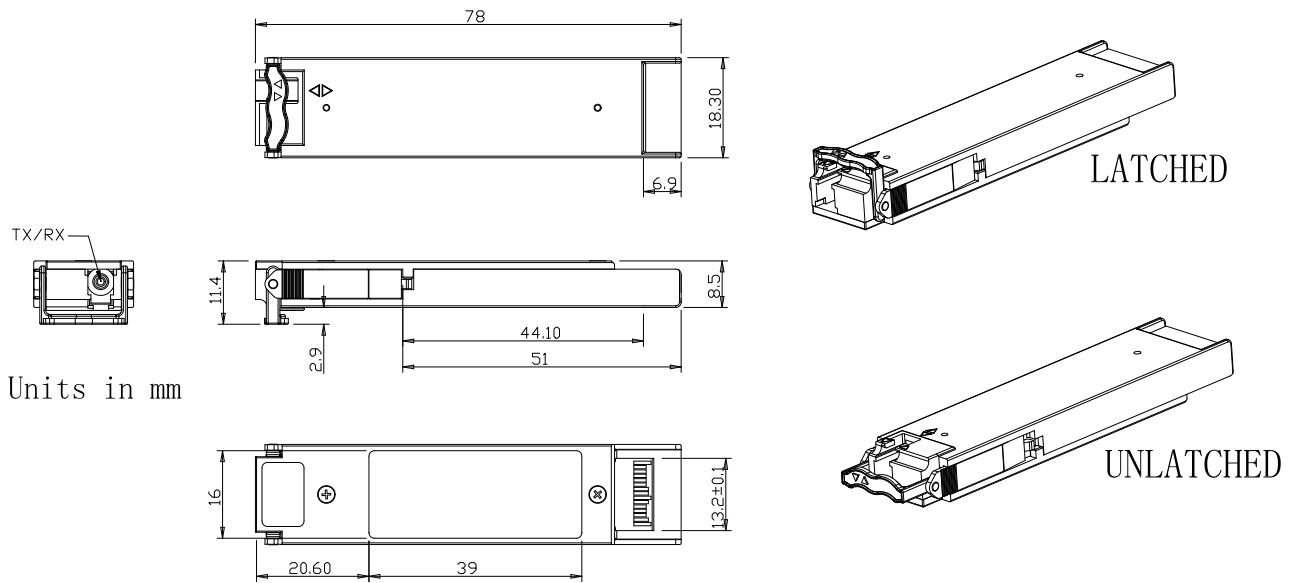
The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the XFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the XFP transceiver. The serial data signal (SDA pin) 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 2-wire serial interface provides sequential or random access to the 8 bit parameters, addressed from 000h to the maximum address of the memory.

For more detailed information including memory map definitions, please see the XFP MSA Specification.

## VII. Recommended Block Circuit



**VIII. Outline Dimensions**



Units in mm

**IX. Regulatory Compliance**

| Feature                            | Reference  | Performance               |
|------------------------------------|--|---------------------------|
| Electrostatic discharge (ESD)      | IEC/EN 61000-4-2                                 | Compatible with standards |
| Electromagnetic Interference (EMI) | FCC Part 15 Class B EN 55022 Class B (CISPR 22A) | Compatible with standards |
| Laser Eye Safety                   | FDA 21CFR 1040.10, 1040.11 IEC/EN 60825-1, 2     | Class 1 laser product     |
| Component Recognition              | IEC/EN 60950 , UL                                | Compatible with standards |
| ROHS                               | 2002/95/EC                                       | Compatible with standards |
| EMC                                | EN61000-3  | Compatible with standards |

### Appendix A. Document Revision

| Version No. | Date       | Description           |
|-------------|------------|-----------------------|
| 1.0         | 2020-09-01 | Preliminary datasheet |