

# PRODUCT SPECIFICATION



## GLXP-1596-40D(I)

10Gb/s Duplex LC, SMF, 1550nm EML, PIN Receiver, ER 40km SFP+ Transceiver

### ■ Features:

- ★ Support multi-protocol from 8.5Gb/s to 11.3Gb/s
- ★ Hot-Pluggable SFP+ footprint
- ★ Cooled 1550nm EML laser transmitter
- ★ PIN Receiver
- ★ Duplex LC connector
- ★ Up to 40 km on 9/125μm SMF
- ★ Single +3.3V Power Supply
- ★ Compliant with SFF-8431 SFF-8432 and IEEE802.3ae
- ★ Low power dissipation <1.8W typically
- ★ Industrial /Extended/ Commercial operating temperature range: -40°C to 85°C/-5°C to 85°C/0°C to 70°C Version available
- ★ RoHS compliant



### ■ Applications:

- ★ 10GBASE-ER/EW Ethernet
- ★ 40km 10G Fiber channel
- ★ SONET OC-192/SDH STM-64

### ■ Description:

GLight GLXP-1596-40D(I) transceivers are Enhanced Small Form Factor Pluggable SFP+ transceivers designed for use in 10-Gigabit multi-rate links up to 40km of G.652 single mode fiber. They are compliant with SFF-8431, SFF-8432 and 10GBASE ER/EW; support 4x, 8x and 10x Fibre Channel. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472. GLight GLXP-1596-40D(I) transceivers are RoHS compliant per Directive 2011/65/EU. The high performance 1550nm EML transmitter and high sensitivity PIN receiver provide superior performance for Ethernet applications at up to 40km links.

## ■ Absolute Maximum Ratings

| Parameter           | Symbol   | Min. | Typical | Max. | Unit |
|---------------------|----------|------|---------|------|------|
| Storage Temperature | $T_s$    | -40  |         | +85  | °C   |
| Supply Voltage      | $V_{CC}$ | -0.5 |         | 4    | V    |
| Relative Humidity   | RH       | 0    |         | 85   | %    |
| Industrial          | TC       | -40  |         | +85  | °C   |
| Commercial          | TC       | 0    |         | 70   | °C   |

## ■ Electrical Characteristics ( $T_{OP} = T_c$ , $V_{CC} = 3.135$ to $3.465$ Volts)

| Parameter                     | Symbol         | Min.     | Typical | Max.           | Unit     | Note |
|-------------------------------|----------------|----------|---------|----------------|----------|------|
| Supply Voltage                | $V_{CC}$       | 3.14     | 3.30    | 3.47           | V        |      |
| Supply Current                | $I_{CC}$       |          |         | 550            | mA       |      |
| Inrush Current                | $I_{surge}$    |          |         | $I_{CC}+30$    | mA       |      |
| Maximum Power                 | $P_{max}$      |          |         | 1.8            | W        |      |
| <b>Transmitter Section:</b>   |                |          |         |                |          |      |
| Input differential impedance  | $R_{in}$       |          | 100     |                | $\Omega$ | 1    |
| Single ended data input swing | $V_{in PP}$    | 180      |         | 700            | mVp-p    | 2    |
| Transmit Disable Voltage      | $V_D$          | 2        |         | $V_{CC}$       | V        | 3    |
| Transmit Enable Voltage       | $V_{EN}$       | $V_{EE}$ |         | $V_{EE}+0.8$   | V        |      |
| Transmit Disable Assert Time  | $T_{dessert}$  |          |         | 10             | us       |      |
| <b>Receiver Section:</b>      |                |          |         |                |          |      |
| Rx Output Diff Voltage        | $V_O$          | 300      |         | 850            | mV       | 3    |
| Data output rise time         | $t_r$          | 30       |         |                | ps       | 4    |
| Data output fall time         | $t_f$          | 30       |         |                | ps       | 4    |
| LOS Fault                     | $V_{losfault}$ | 2        |         | $V_{CC\_host}$ | V        | 5    |
| LOS Normal                    | $V_{los norm}$ | $V_{EE}$ |         | $V_{EE}+0.8$   | V        | 5    |

Note:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Per SFF-8431 Rev 3.0
3. Into 100 ohms differential termination.
4. 20%~80%
5. LOS is an open collector output. Should be pulled up with 4.7k – 10k $\Omega$  on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.

## ■ Optical Parameters( $T_{OP} = T_c$ , $VCC = 3.135$ to $3.465$ Volts)

| Parameter                      | Symbol  | Min. | Typical | Max. | Unit  | Note |
|--------------------------------|---|------|---------|------|-------|------|
| <b>Transmitter Section:</b>    |   |      |         |      |       |      |
| Center Wavelength              | $\lambda_c$                                       | 1530 | 1550    | 1570 | nm    |      |
| Spectral Width                 | $\Delta \lambda$                                  |      |         | 0.3  | nm    |      |
| Side Mode Suppression Ratio    | SMSR  | 30   |         |      | dB    |      |
| Optical Output Power           | $P_{out}$   | -1   |         | 3    | dBm   |      |
| Optical Power OMA              | $P_{OMA}$   | -2.1 |         |      | dBm   |      |
| Optical Rise/Fall Time         | $t_r / t_f$                                       |      |         | 260  | ps    |      |
| Laser Off Power                | $P_{off}$   |      |         | -30  | dBm   |      |
| Extinction Ratio               | ER  | 6    |         |      | dB    |      |
| Transmitter Dispersion Penalty | TDP   |      |         | 3.0  | dB    | 2    |
| Relative Intensity Noise       | RIN   |      |         | -128 | dB/Hz | 3    |
| Optical Return Loss Tolerance  |   | 21   |         |      | dB    |      |
| Eye Mask for Optical Output    | Compliant with IEEE802.3 z (class 1 laser safety) |      |         |      |       |      |
| <b>Receiver Section:</b>       |   |      |         |      |       |      |
| Optical Input Wavelength       |   | 1530 |         | 1570 | nm    |      |
| Receiver Overload              | $P_{ol}$  | -1   |         |      | dBm   | 5    |
| RX Sensitivity                 | Sen   |      |         | -15  | dBm   | 4    |
| Stressed Sensitivity (OMA)     | Sen <sub>ST</sub>                                 |      |         |      | dBm   | 4    |
| RX_LOS Assert                  | LOS <sub>A</sub>                                  | -30  |         |      | dBm   |      |
| RX_LOS Deassert                | LOS <sub>D</sub>                                  |      |         | -16  | dBm   |      |
| RX_LOS Hysteresis              | LOS <sub>H</sub>                                  | 0.5  |         |      | dB    |      |
| Receiver Reflectance           | R <sub>rx</sub>                                   |      |         | -26  | dB    |      |

Note:

1. Average power figures are informative only, per IEEE802.3ae.
2. TWDP figure requires the host board to be SFF-8431 compliant. TWDP is calculated using the Matlab code provided in clause 68.6.6.2 of IEEE802.3ae.
3. 12dB reflection.
4. Conditions of stressed receiver tests per IEEE802.3ae. CSRS testing requires the host board to be SFF-8431 compliant.
5. Receiver overload specified in OMA and under the worst comprehensive stressed condition.

## Pin Assignment

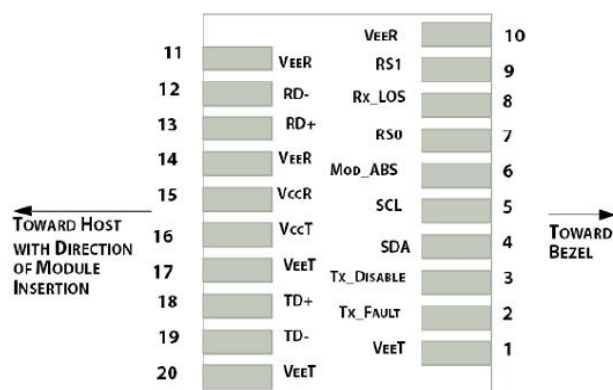


Figure2:Diagram of Host Board Connector Block Pin Numbers and Names

## Pin Description

| Pin No | Name       | Function  | Notes |
|--------|------------|---|-------|
| 1      | VeeT       | Transmitter Ground  | 1     |
| 2      | TX Fault   | Transmitter Fault Indication  | 2     |
| 3      | TX Disable | Transmitter Disable   | 3     |
| 4      | SDL        | 2 wire serial interface data input/output (SDA)   |       |
| 5      | SCL        | 2 wire serial interface clock input (SCL)   |       |
| 6      | MOD-ABS    | Module Absent, connect to VeeR or VeeT in the module  | 2     |
| 7      | RS0        | Rate select0, optionally control SFP+ receiver. When high, input data rate >4.5Gb/ s; when low, input data rate <=4.5Gb/s   |       |
| 8      | LOS        | Loss of Signal  | 4     |
| 9      | RS1        | Rate select0, optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s |       |
| 10     | VeeR       | Receiver Ground   | 1     |
| 11     | VeeR       | Receiver Ground   | 1     |
| 12     | RD-        | Inv. Received Data Out  |       |
| 13     | RD+        | Received Data Out   |       |
| 14     | VeeR       | Receiver Ground   | 1     |
| 15     | VccR       | Receiver Power  |       |
| 16     | VccT       | Transmitter Power   |       |
| 17     | VeeT       | Transmitter Ground  | 1     |
| 18     | TD+        | Transmit Data In  |       |
| 19     | TD-        | Inv. Transmit In  |       |
| 20     | VeeT       | Transmitter Ground  | 1     |

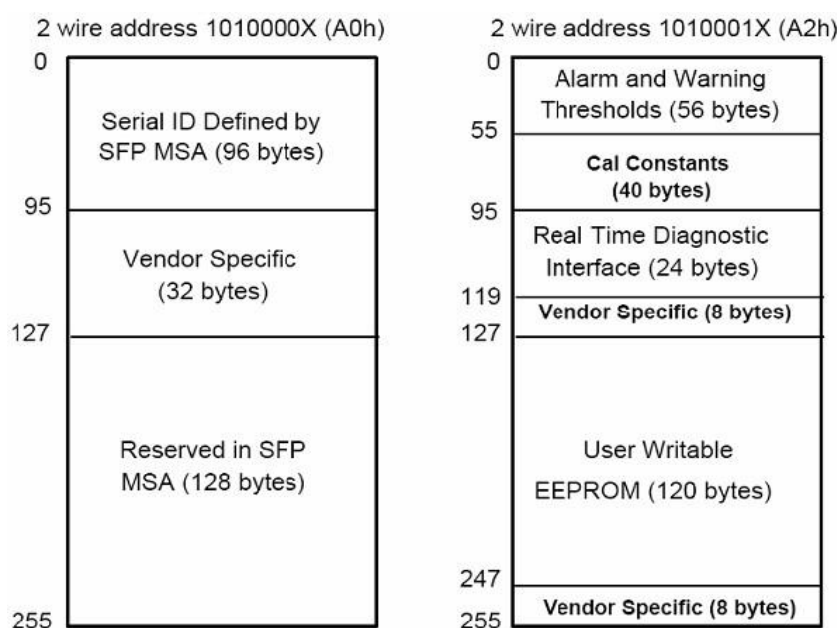
**Notes:**

1. The module ground pins shall be isolated from the module case.
2. This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host\_Vcc on the host board.
3. This pin shall be pulled up with 4.7K-10Kohms to VccT in the module.
4. This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host\_Vcc on the host board.

## ■ SFP Module EEPROM Information and Management

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP-8472. The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I<sup>2</sup>C interface at address A0h and A2h. The memory is mapped in Table 1. Detailed ID information (A0h) is listed in Table 2. And the DDM specification at address A2h. For more details of the memory map and byte definitions, please refer to the SFF-8472, “Digital Diagnostic Monitoring Interface for Optical Transceivers”. The DDM parameters have been internally calibrated.

**Table 1.** Digital Diagnostic Memory Map (Specific Data Field Descriptions)



**Table 2 - EEPROM Serial ID Memory Contents (A0h)**

| Data Address              | Length (Byte) | Name of Length   | Description and Contents   |
|---------------------------|---------------|------------------|--|
| Base ID Fields            |               |                  |  |
| 0                         | 1             | Identifier       | Type of Serial transceiver (03h=SFP)   |
| 1                         | 1             | Reserved         | Extended identifier of type serial transceiver (04h)   |
| 2                         | 1             | Connector        | Code of optical connector type (07=LC)   |
| 3-10                      | 8             | Transceiver      | 10GBASE-ER   |
| 11                        | 1             | Encoding         | 64B/66B  |
| 12                        | 1             | BR,Nominal       | Nominal baud rate, unit of 100Mbps   |
| 13                        | 1             | Reserved         | (0000h)  |
| 14                        | 1             | Length(9um,km)   | Link length supported for 9/125um fiber, units of km   |
| 15                        | 1             | Length(9um)      | Link length supported for 9/125um fiber, units of 100m   |
| 16                        | 1             | Length(50um)     | Link length supported for 50/125um fiber, units of 10m   |
| 17                        | 1             | Length(62.5um)   | Link length supported for 62.5/125um fiber, units of 10m   |
| 18                        | 1             | Length(Copper)   | Link length supported for copper, units of meters  |
| 19                        | 1             | Reserved         |  |
| 20-35                     | 16            | Vendor Name      | SFP vendor name:   |
| 36                        | 1             | Reserved         |  |
| 37-39                     | 3             | Vendor OUI       | SFP transceiver vendor OUI ID  |
| 40-55                     | 16            | Vendor PN        | Part Number: "xxxxxxx" (ASCII)   |
| 56-59                     | 4             | Vendor rev       | Revision level for part number   |
| 60-61                     | 2             | Wavelength       | Laser wavelength   |
| 62                        | 1             | Reserved         |  |
| 63                        | 1             | CCID             | Least significant byte of sum of data in address 0-62  |
| Extended ID Fields        |               |                  |  |
| 64-65                     | 2             | Option           | Indicates which optical SFP signals are implemented(001Ah = LOS, TX_FAULT, TX_DISABLE all supported) |
| 66                        | 1             | BR, max          | Upper bit rate margin, units of %  |
| 67                        | 1             | BR, min          | Lower bit rate margin, units of %  |
| 68-83                     | 16            | Vendor SN        | Serial number (ASCII)  |
| 84-91                     | 8             | Date code        | Manufacturing date code  |
| 92                        | 1             | Diagnostic Type  | Diagnostics  |
| 93                        | 1             | Enhanced Options | Diagnostics  |
| 94                        | 1             | SFF-8472         | Diagnostics  |
| 95                        | 1             | CCEX             | Check code for the extended ID Fields (addresses 64 to 94)   |
| Vendor Specific ID Fields |               |                  |  |
| 96-127                    | 32            | Readable         | Vendor specific date, read only  |
| 128-255                   | 128           | Reserved         | Reserved for SFF-8079  |

## ■ Digital Diagnostic Monitor Characteristics

| Data Address | Parameter                        | Accuracy | Unit | Calibraton |
|--------------|----------------------------------|----------|------|------------|
| 96-97        | Transceiver Internal Temperature | ±3.0     | °C   | internal   |
| 98-99        | VCC3 Internal Supply Voltage     | ±5.0     | %    | internal   |
| 100-101      | Laser Bias Current               | ±10      | %    | internal   |
| 102-103      | Tx Output Power                  | ±3.0     | dBm  | internal   |
| 104-105      | Rx Input Power                   | ±3.0     | dBm  | internal   |

## ■ Regulatory Compliance

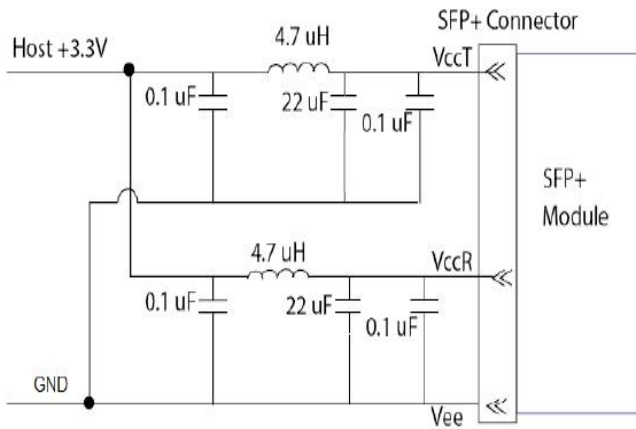
The transceiver complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

|   |  |  |
|---|--|--|
| Electrostatic Discharge (ESD) to the Electrical Pins      | MIL-STD-883E<br>Method 3015.7                                      | Class 1(>1000 V)                       |
| Electrostatic Discharge (ESD) to the Duplex LC Receptacle | IEC 61000-4-2<br>GR-1089-CORE                                      | Compatible with standards              |
| Electromagnetic Interference (EMI)                        | FCC Part 15 Class B<br>EN55022 Class B (CISPR 22B)<br>VCCI Class B | Compatible with standards              |
| Laser Eye Safety  | FDA 21CFR 1040.10 and 1040.11<br>EN60950, EN (IEC) 60825-1,2       | Compatible with Class 1 laser product. |

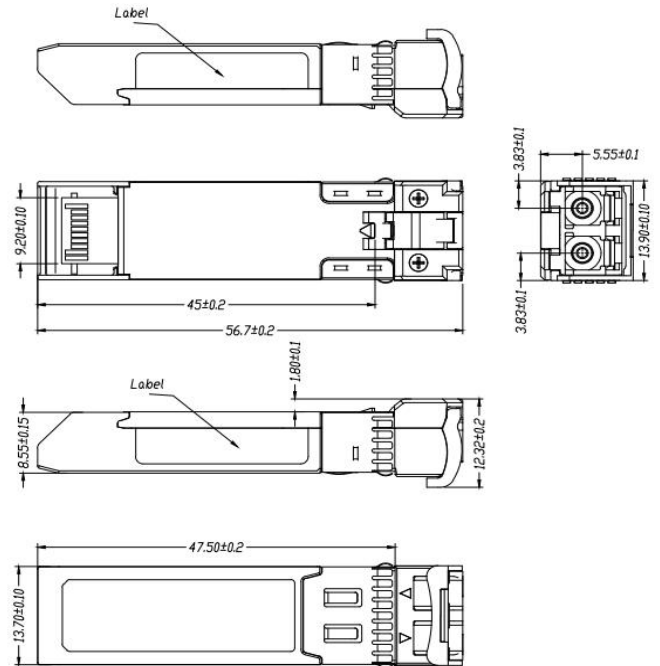
## ■ References

1. IEEE Std 802.3, 2002 Edition, Clause 38, PMD Type 1000BASE-LX. IEEE Standards Department, 2002.
2. “Fibre Channel Physical and Signaling Interface (FC-PH, FC-PH2, FC-PH3)”. American National Standard for Information Systems.
3. “Fibre Channel Draft Physical Interface Specification (FC-PI 13.0)”. American National Standard for Information Systems.
4. Small Form-factor Pluggable (SFP) Transceiver Multi-source Agreement (MSA) September 14, 2000.

## ■ Recommended Circuit & Mechanical Dimensions



**Recommended Host Board Power Supply Circuit**



**Mechanical Drawing**

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