**ETU-LINK**
Optical Communication System

# SFP28 Series

## SFP28

### ES2312X-3LED10

### 25Gbps 1310nm 10KM SFP28 Transceiver

- Hot-pluggable SFP28 form factor

- Supports 25Gbps data rate

- Maximum link length of 10km

- 1310nm DFB laser and PIN photo-detector

- Internal CDR on both Transmitter and
  Receiver channel

- Duplex LC receptacle

- Single 3.3V power supply

- Power dissipation < 1.5W

- Digital diagnostics functions are available via
  the I2C interface

- RoHS-6 compliant

- Commercial case temperature range:

  Extend: -20°C to 85°C

## Applications

- 25GBASE-LR Ethernet

## Description

The ES2312X-3LED10 is a single-Channel, Pluggable, Fiber-Optic SFP28 for 25 Gigabit Ethernet and Infiniband EDR Applications. It is a high performance module for short-range data communication and interconnect applications which operate at 25.78125 Gbps up to 10km. This module is designed to operate over single mode fiber systems using a nominal wavelength of 1310nm. The electrical interface uses a 20 contact edge type connector. The optical interface uses duplex LC receptacle. This module incorporates proven circuit and technology to provide reliable long life, high performance, and consistent service.

## Block Diagram
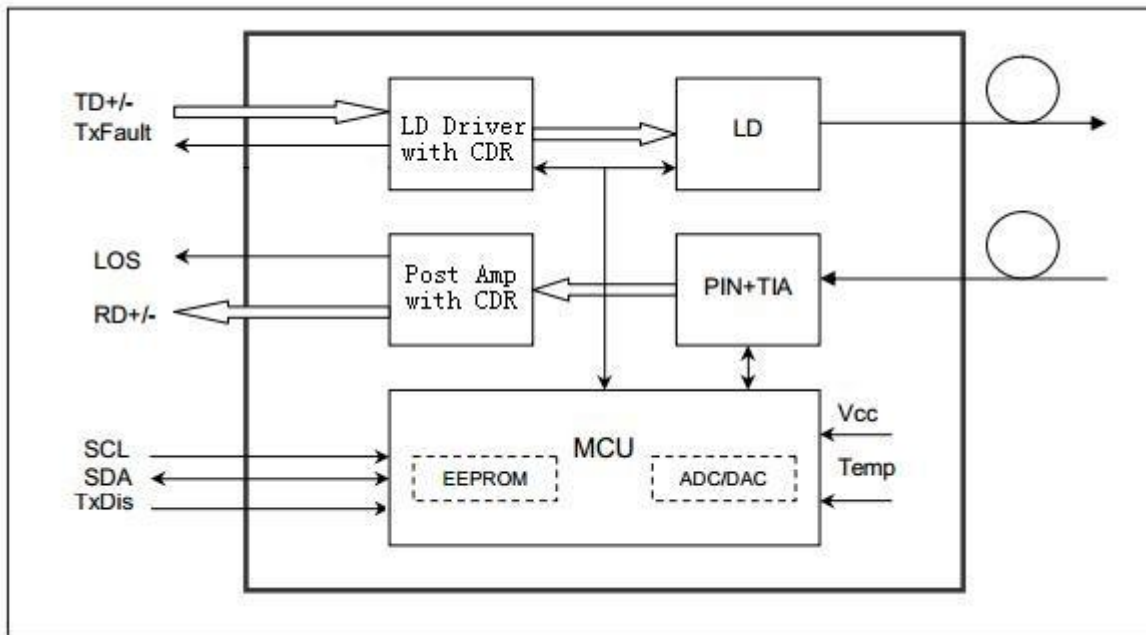


## Absolute Maximum Ratings

**Table1 - Absolute Maximum Ratings**

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Supply Voltage | Vcc | 0 | 3.6 | V |
| Storage Temperature | Ts | -40 | 85 | °C |
| Operating Humidity | - | 5 | 85 | % |

## Recommended Operating Conditions

**Table2 - Recommended Operating Conditions**

| Parameter | | Symbol | Min | Typical | Max | Unit |
|---|---|---|---|---|---|---|
| Operating Case Temperature | Commercial | Tc | -20 | | 85 | °C |
| Power Supply Voltage | | Vcc | 3.13 | 3.3 | 3.47 | V |
| Power Supply Current | | Icc | | | 450 | mA |

# Optical and Electrical Characteristics

**Table 3 - Optical and Electrical Characteristics**

| Parameter | | Symbol | Min | Typical | Max | Unit | Notes |
|---|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | | |
| Data rate | | BR | | 25.78 | | Gbps | |
| Centre Wavelength | | λc | 1290 | 1310 | 1330 | nm | |
| Spectral Width (-20dB) | | σ | | | 1 | nm | |
| Side Mode Suppression Ratio | | SMSR | 30 | | | dB | |
| Average Output Power | | Pavg | 2 | | 3 | dBm | |
| Extinction Ratio | | ER | 4.0 | | | dB | |
| Differential data input swing | | $V_{IN,PP}$ | 180 | | 700 | mV | |
| Input Differential Impedance | | $Z_{IN}$ | 90 | 100 | 110 | Ω | |
| TX Disable | Disable | | 2.0 | | Vcc | V | |
| | Enable | | 0 | | 0.8 | V | |
| TX Fault | Fault | | 2.0 | | Vcc | V | |
| | Normal | | 0 | | 0.8 | V | |
| **Receiver** | | | | | | | |
| Data rate | | BR | | 25.78 | | Gbps | |
| Centre Wavelength | | λc | 1260 | 1310 | 1360 | nm | |
| Receiver Sensitivity (OMA) | | Psens | - | - | -11.5 | dBm | |
| Stressed Sensitivity (OMA) | | | - | - | -6.8 | dBm | |
| LOS De-Assert | | $LOS_D$ | | | -12.5 | dBm | |
| LOS Assert | | $LOS_A$ | | | -13.5 | dBm | |
| LOS Hysteresis | | | 0.5 | | | dB | |
| Differential data output swing | | Vout,PP | 300 | | 900 | mV | |
| LOS | High | | 2.0 | | Vcc | V | |
| | Low | | | | 0.8 | V | |

**Notes:**

# Timing and Electrical

**Table 4 - Timing and Electrical**

| Parameter | Symbol | Min. | Max. | Unit | Conditions |
|---|---|---|---|---|---|
| Tx_Disable assert time | t_off | | 100 | μs | Rising edge of Tx_Disable to fall of output signal below 10% of nominal |
| Tx_Disable negate time | t_on | | 2 | ms | Falling edge of Tx_Disable to rise of output signal above 90% of nominal. This only applies in normal operation, not during start up or fault recovery. |
| Time to initialize 2-wire interface | t_2w_start_up | | 300 | ms | From power on or hot plug after the supply meeting Table 8. |
| Time to initialize | t_start_up | | 300 | ms | From power supplies meeting Table 8 or hot plug or Tx disable negated during power up, or Tx_Fault recovery, until non-cooled power level I part (or non-cooled power level II part already enabled at power level II for Tx_Fault recovery) is fully operational. |
| Time to initialize cooled module and time to power up a cooled module to Power Level II | t_start_up_cooled | | 90 | s | From power supplies meeting Table 8 or hot plug, or Tx disable negated during power up or Tx_Fault recovery, until cooled power level I part (or cooled power level II part during fault recovery) is fully operational. Also, from stop bit low-to-high SDA transition enabling Power Level II until cooled module is fully operational |
| Time to Power Up to Level II | t_power_level2 | | 300 | ms | From stop bit low-to-high SDA transition enabling power level II until non-cooled module is fully operational |
| Time to Power Down from Level II | t_power_down | | 300 | ms | From stop bit low-to-high SDA transition disabling power level II until module is within power level I requirements |
| Tx_Fault assert | Tx_Fault_on | | 1 | ms | From occurrence of fault to assertion of Tx_Fault |
| Tx_Fault assert for cooled module | Tx_Fault_on_cooled | | 50 | ms | From occurrence of fault to assertion of Tx_Fault |
| Tx_Fault Reset | t_reset | 10 | | μs | Time Tx_Disable must be held high to reset Tx_Fault |
| RS0, RS1 rate select timing for FC | t_RS0_FC, t_RS1_FC | | 500 | μs | From assertion till stable output |
| RS0, RS1 rate select timing non FC | t_RS0, t_RS1 | | 24 | ms | From assertion till stable output |
| Rx_LOS assert delay | t_los_on | | 100 | μs | From occurrence of loss of signal to assertion of Rx_LOS |
| Rx_LOS negate delay | t_los_off | | 100 | μs | From occurrence of presence of signal to negation of Rx_LOS |

## Diagnostics

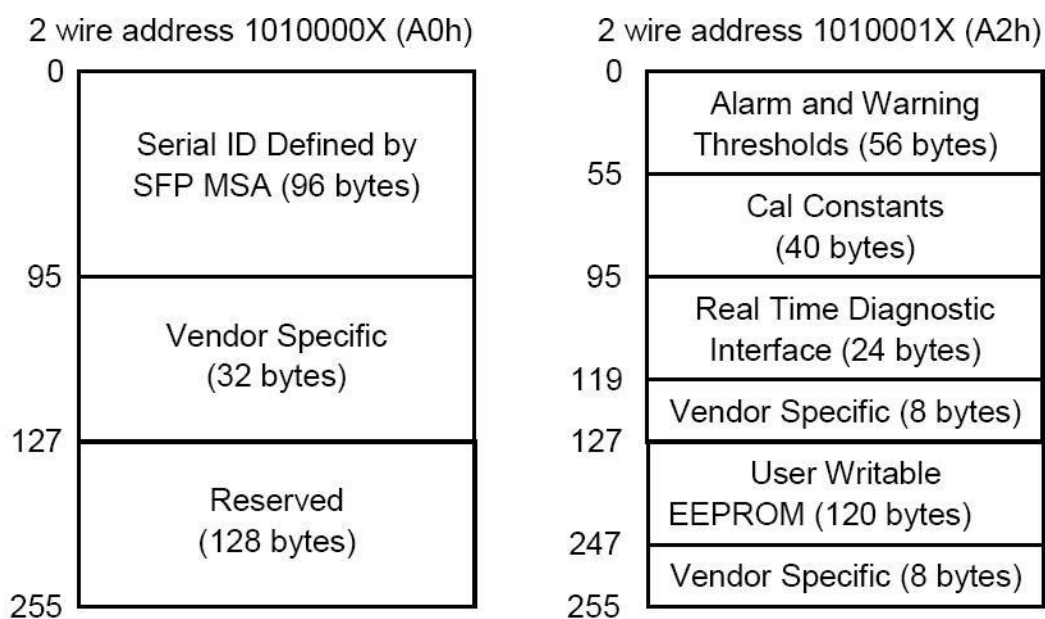**Table5 – Diagnostics Specification**

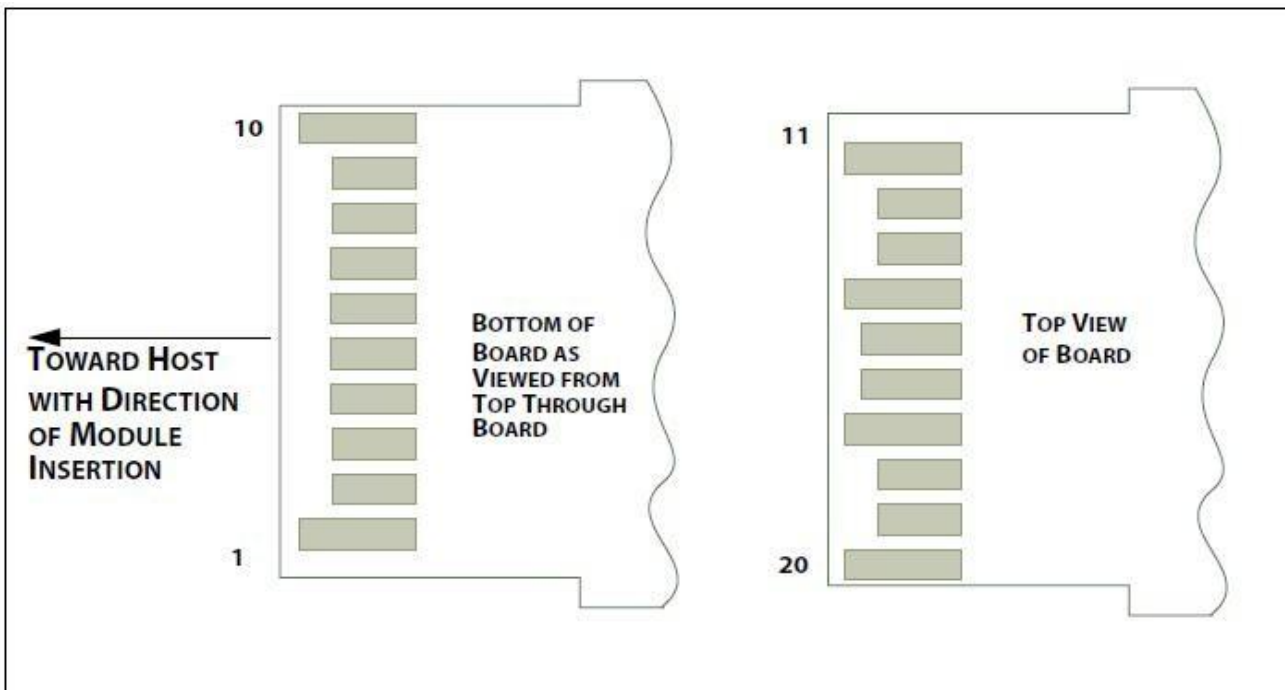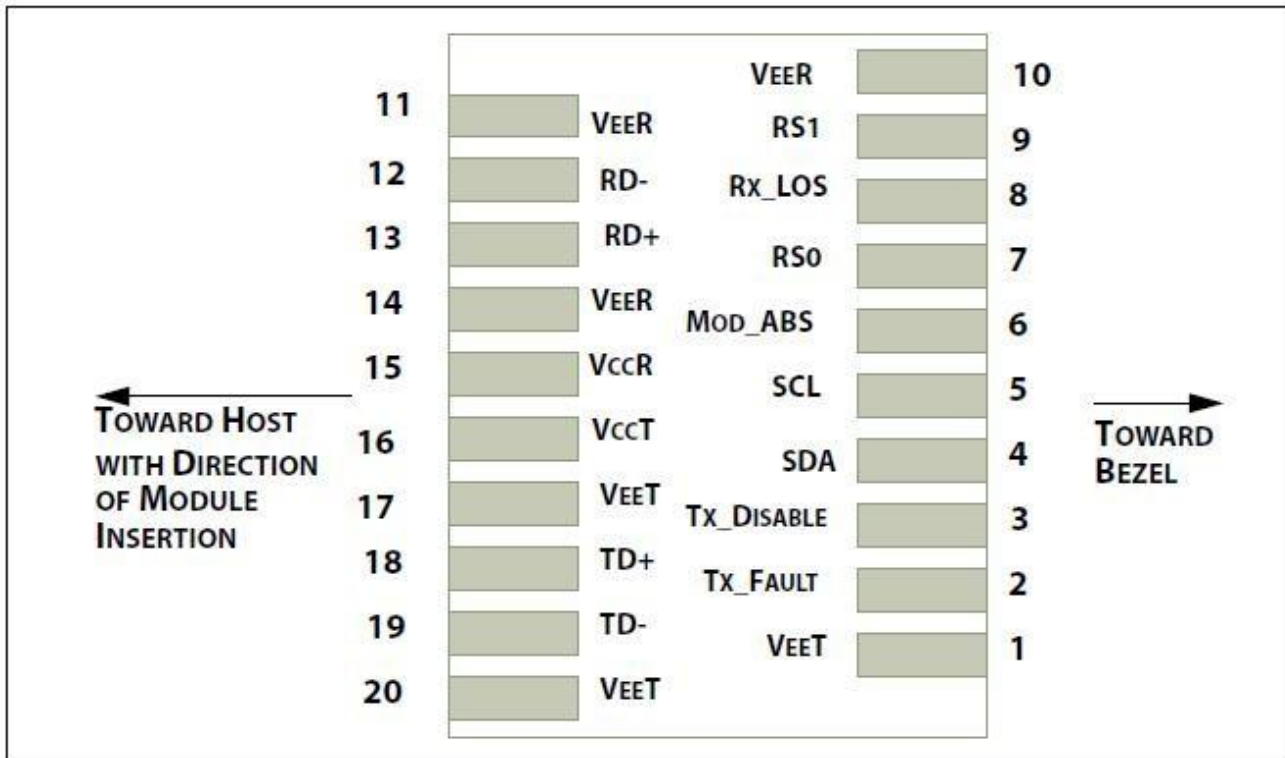| Parameter | Range | Unit | Accuracy | Calibration |
|---|---|---|---|---|
| Temperature | 0 to +70 | °C | ±3°C | Internal / External |
| Voltage | 3.0 to 3.6 | V | ±3% | Internal / External |
| Bias Current | 0 to 100 | mA | ±10% | Internal / External |
| TX Power | -8 to 3 | dBm | ±3dB | Internal / External |
| RX Power | -14 to 0 | dBm | ±3dB | Internal / External |

## Digital Diagnostic Memory Map

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.

## Pin Definitions



| | | |
|---|---|---|
| 11 | VEER | |
| 12 | RD- | |
| 13 | RD+ | |
| 14 | VEER | |
| 15 | VCCR | |
| 16 | VCCT | |
| 17 | VEET | |
| 18 | TD+ | |
| 19 | TD- | |
| 20 | VEET | |

VEER 10
RS1 9
Rx_LOS 8
RS0 7
MOD_ABS 6
SCL 5
SDA 4
Tx_DISABLE 3
Tx_FAULT 2
VEET 1

TOWARD HOST WITH DIRECTION OF MODULE INSERTION

TOWARD BEZEL

10

1

TOWARD HOST WITH DIRECTION OF MODULE INSERTION

BOTTOM OF BOARD AS VIEWED FROM TOP THROUGH BOARD

11

20

TOP VIEW OF BOARD

## Pin Descriptions

| PIN | Logic | Symbol | Name / Description | Note |
|-----|-------|--------|--------------------|------|
| 1 | | VeeT | Module Transmitter Ground | 1 |
| 2 | LVTTL-O | TX_Fault | Module Transmitter Fault | 2 |
| 3 | LVTTL-I | TX_Dis | Transmitter Disable; Turns off transmitter laser output | |
| 4 | LVTTL-I/O | SDA | 2-Wire Serial Interface Data Line | 2 |
| 5 | LVTTL-I | SCL | 2-Wire Serial Interface Clock | 2 |
| 6 | | MOD_ABS | Module Definition, Grounded in the module | |
| 7 | LVTTL-I | RS0 | Receiver Rate Select | |
| 8 | LVTTL-O | RX_LOS | Receiver Loss of Signal Indication Active LOW | |
| 9 | LVTTL-I | RS1 | Transmitter Rate Select (not used) | |
| 10 | | VeeR | Module Receiver Ground | 1 |
| 11 | | VeeR | Module Receiver Ground | 1 |
| 12 | CML-O | RD- | Receiver Inverted Data Output | |
| 13 | CML-O | RD+ | Receiver Data Output | |
| 14 | | VeeR | Module Receiver Ground | 1 |
| 15 | | VccR | Module Receiver 3.3 V Supply | |
| 16 | | VccT | Module Receiver 3.3 V Supply | |
| 17 | | VeeT | Module Transmitter Ground | 1 |
| 18 | CML-I | TD+ | Transmitter Non-Inverted Data Input | |
| 19 | CML-I | TD- | Transmitter Inverted Data Input | |
| 20 | | VeeT | Module Transmitter Ground | 1 |

**Notes:**

1. Module ground pins GND are isolated from the module case.

2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

## Recommended Interface Circuit
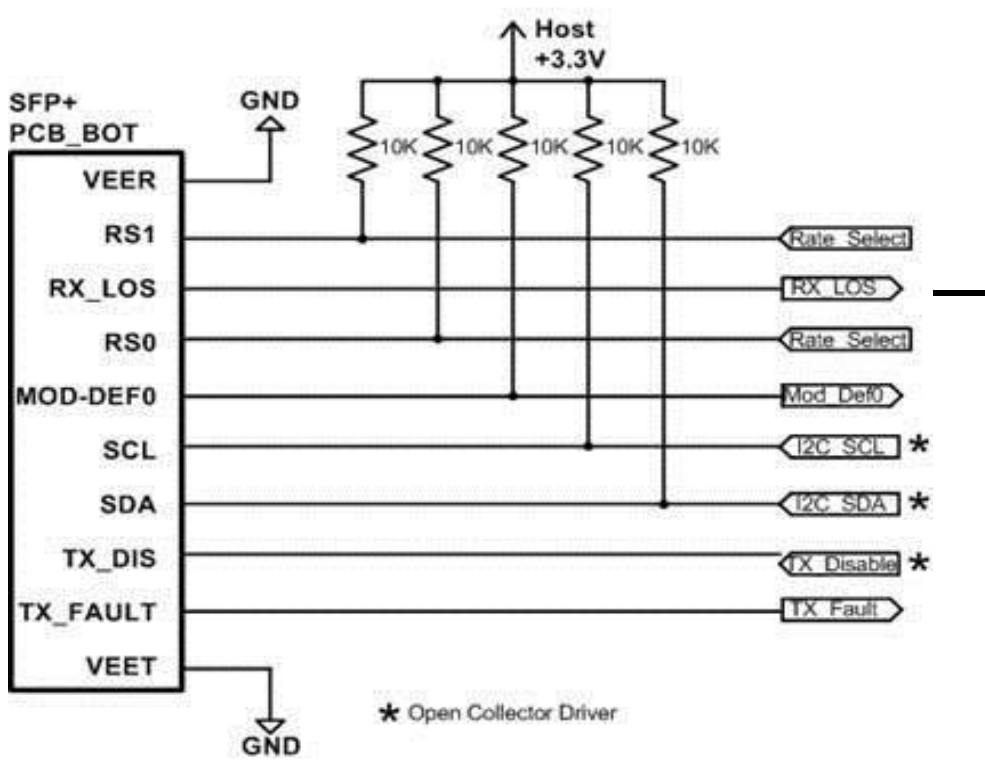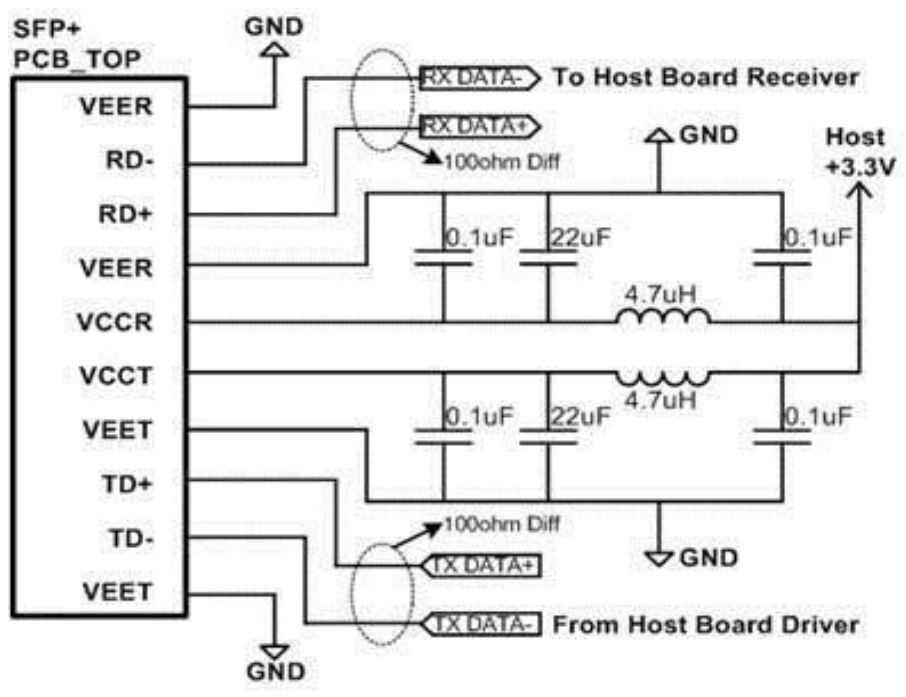
# Mechanical Dimensions
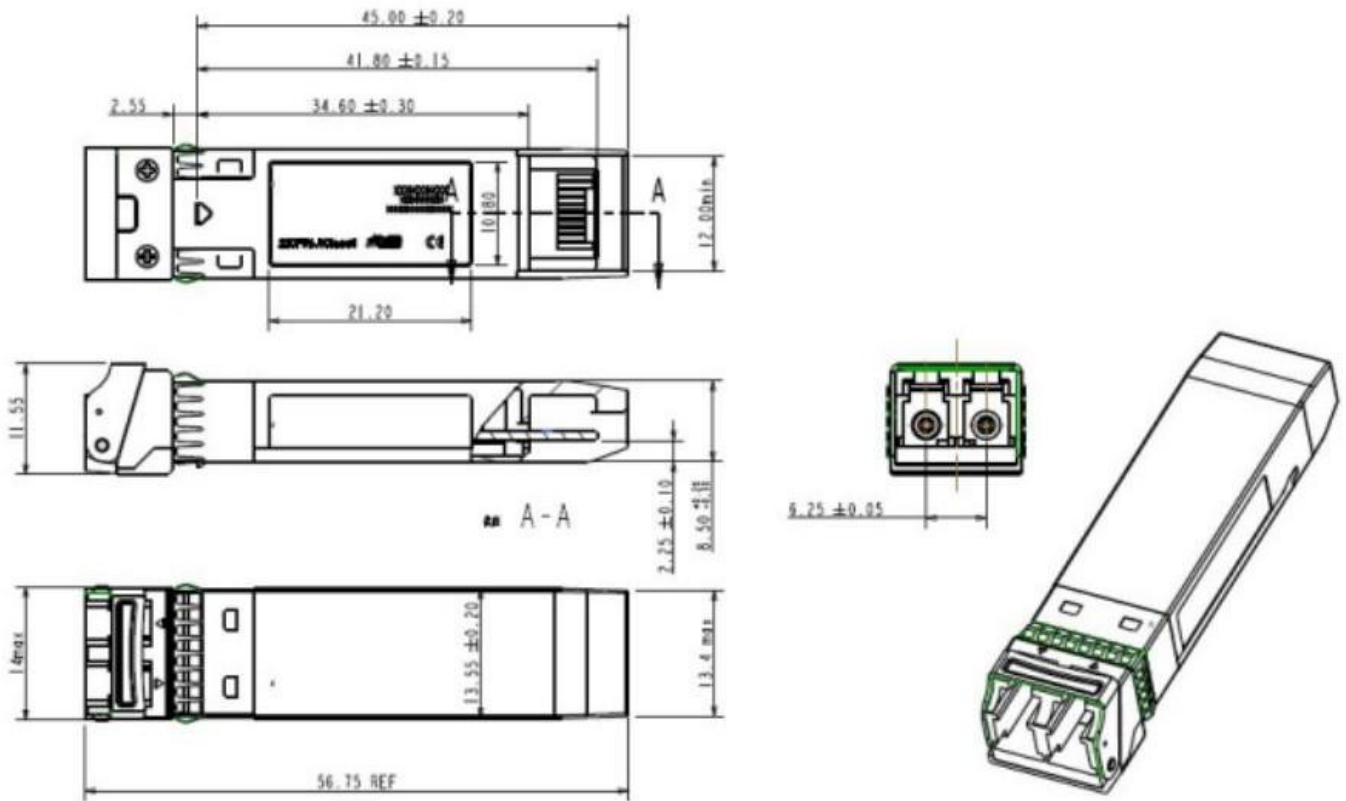


# Ordering information

| Part Number | Product Description |
|---|---|
| ES2312X-3LED10 | 25Gbps, 1310nm; SFP28, 10km, DDM  -20ºC ~ +85ºC |

## Compatibility Test

In order to ensure the product compatibility, our products will be tested on the switch before shipment. Our modules can compatible with many mainstream brand switches, such as Cisco, Juniper, Extreme, Brocade,IBM, H3C, HP, Huawei, D-Link, Mikrotik, ZTE, TP-Link...

Our test equipment: VOLKTEK MEN-4110, HP 2530-8G, CRS226-24G-25+RM, Catalyst 2960G Series, Catalyst 3850 XS 10G SFP+, Catalyst 3750-E Series, HUAWEI S5700Series, H3C S3100V2 Series, Juniper-EX4200, etc.



Cisco Catalyst 3850

HUAWEI S5700

H3C S3100V2

HP J9264AR

Juniper EX 4200

Alcatal 6850E-U24X

Mikrotik CR5226-24G-25+RM

Cisco Catalyst 2960G

Volktek MEN-4110

## Product Production Process

# Quality Assurance

Continuous introduction of new equipment, produced by strict standards, strict quality inspection, to guarantee the high quality standard of each product.
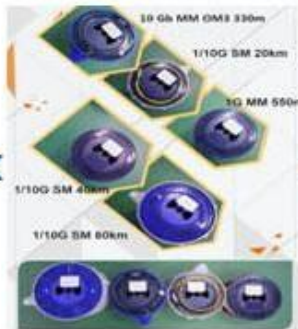


**Standardized Production Line**



**Professional Welding**



**Assembling**



**Aging Testing**



**Distance Testing**



**Cleaning end face**



**Product Initial Test**



**Switch Testing**



**Product Final Test**

## Packaging

ETU-Link provides two kinds of packaging, 10pcs/Tray and individual package.



Company: ETU-Link Technology Co., LTD

Address: Right side of 3rd floor, No. 102 building, Longguan expressway, Dalang street, Longhua District, Shenzhen city, GuangDongProvince,China 518109

Tel: +86-755 2328 4603

Addresses and phone number also have been listed at www.etulinktechnology.com.

Please e-mail us at sales@etulinktechnology.com or call us for assistance.