

**ETU-LINK****SFP Series**

Optical Communication System

SFP

ESDxx12-3LCD160

1.25Gbps DWDM SFP Optical Transceiver, 160KM Reach

- Up to 1.25Gb/s data links
- DWDM DML laser transmitter and APD photo-detector
- 100 GHz ITU channel spacing with integrated wavelength locker
- Up to 160km on 9/125um SMF
- Hot-pluggable SFP footprint
- Duplex LC/UPC type pluggable optical interface
- Low power dissipation
- RoHS-10 compliant and lead-free
- Support Digital Monitoring interface
- Single +3.3V power supply
- Compliant with SFF-8472
- Metal enclosure, for lower EMI
- Meet ESD requirements, resist 8KV direct contact voltage
- Case operating temperature

Commercial: 0 ~ +70°C

Extended: -10 ~ +80°C

Industrial: -40 ~ +85°C



Applications

- SONET/SDH networks
- Gigabit Ethernet
- C Band DWDM networks
- Fiber Channel
- Other Optical Links

Description

ETU-Link DWDM SFP transceivers include an APD photo-detector diode and temperature stabilized DWDM DML transmitter. Digital diagnostic functions are available via an I2C. This module is designed for single mode fiber and operates at a nominal wavelength of 100GHz ITU Grid, C Band DWDM wavelength. Digital diagnostic functions are available via a 2-wire serial interface, as specified in SFF-8472.

The optical output can be disabled by a TTL logic high-level input of Tx Disable, and the system also can disable the module via I2C. Tx Fault is provided to indicate that degradation of the laser.

Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner. The system can also get the LOS (or Link)/Disable/Fault information via I2C register access.

Wavelength Selection: C-band λ c Wavelength Guide Pin Descriptions

| Channel (xx) | Wavelength (nm) | Frequency (THZ) | Channel (xx) | Wavelength (nm) | Frequency (THZ) |
|-----------------|--------------------|--------------------|-----------------|--------------------|--------------------|
| 17 | 1563.86 | 191.70 | 39 | 1546.12 | 193.90 |
| 18 | 1563.05 | 191.80 | 40 | 1545.32 | 194.00 |
| 19 | 1562.23 | 191.90 | 41 | 1544.53 | 194.10 |
| 20 | 1561.42 | 192.00 | 42 | 1543.73 | 194.20 |
| 21 | 1560.61 | 192.10 | 43 | 1542.94 | 194.30 |
| 22 | 1559.79 | 192.20 | 44 | 1542.14 | 194.40 |
| 23 | 1558.98 | 192.30 | 45 | 1541.35 | 194.50 |
| 24 | 1558.17 | 192.40 | 46 | 1540.56 | 194.60 |
| 25 | 1557.36 | 192.50 | 47 | 1539.77 | 194.70 |
| 26 | 1556.55 | 192.60 | 48 | 1538.98 | 194.80 |
| 27 | 1555.75 | 192.70 | 49 | 1538.19 | 194.90 |
| 28 | 1554.94 | 192.80 | 50 | 1537.40 | 195.00 |
| 29 | 1554.13 | 192.90 | 51 | 1536.61 | 195.10 |
| 30 | 1553.33 | 193.00 | 52 | 1535.82 | 195.20 |
| 31 | 1552.52 | 193.10 | 53 | 1535.04 | 195.30 |
| 32 | 1551.72 | 193.20 | 54 | 1534.25 | 195.40 |

| | | | | | |
|----------------|--|--------|----|---------|--------|
| 33 | 1550.92 | 193.30 | 55 | 1533.47 | 195.50 |
| 34 | 1550.12 | 193.40 | 56 | 1532.68 | 195.60 |
| 35 | 1549.32 | 193.50 | 57 | 1531.90 | 195.70 |
| 36 | 1548.51 | 193.60 | 58 | 1531.12 | 195.80 |
| 37 | 1547.72 | 193.70 | 59 | 1530.33 | 195.90 |
| 38 | 1546.92 | 193.80 | 60 | 1529.55 | 196.00 |
| Non-ITU | Peak wavelength between 1528.77nm-1563.86 | | 61 | 1528.77 | 196.10 |

Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

| Parameter | Symbol | Min | Max | Unit | Notes |
|--------------------------------------|----------|------|-----|------|-------|
| Storage Temperature | T_s | -40 | 85 | °C | |
| Power Supply Voltage | V_{CC} | -0.5 | 3.6 | V | |
| Relative Humidity (non-condensation) | RH | 5 | 95 | % | |
| Damage Threshold | TH_d | 0 | | dBm | |

Recommended Operating Conditions

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|-------------------------------|----------|-------|---------|----------|------|------------|
| Operating Case Temperature | T_{OP} | 0 | | 70 | °C | commercial |
| | | -10 | | 80 | | extended |
| | | -40 | | 85 | | Industrial |
| Power Supply Voltage | V_{CC} | 3.135 | 3.3 | 3.465 | V | |
| Data Rate | | | 1.25 | | Gb/s | |
| Control Input Voltage High | | 2 | | V_{CC} | V | |
| Control Input Voltage Low | | 0 | | 0.8 | V | |
| Link Distance (SMF) | D | | | 160 | km | 9/125um |

Pin Assignment and Pin Description

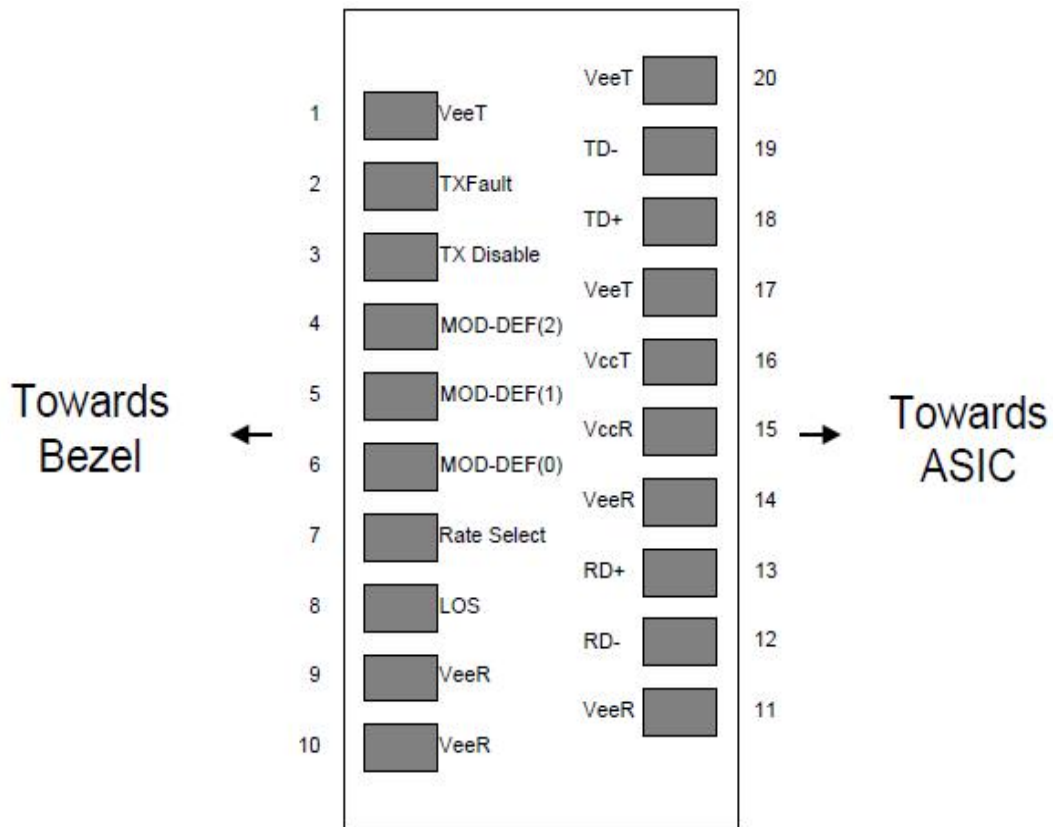


Figure1. Diagram of host board connector block pin numbers and names

| Pin | Symbol | Name/Description | Notes |
|-----|-------------|--|-------|
| 1 | VEET | Transmitter Ground (Common with Receiver Ground) | 1 |
| 2 | TXFAULT | Transmitter Fault. | |
| 3 | TXDIS | Transmitter Disable. Laser output disabled on high or open. | 2 |
| 4 | MOD_DEF (2) | Module Definition 2. Data line for Serial ID. | 3 |
| 5 | MOD_DEF (1) | Module Definition 1. Clock line for Serial ID. | 3 |
| 6 | MOD_DEF (0) | Module Definition 0. Grounded within the module. | 3 |
| 7 | Rate Select | No connection required | 4 |
| 8 | LOS | Loss of Signal indication. Logic 0 indicates normal operation. | 5 |
| 9 | VEER | Receiver Ground (Common with Transmitter Ground) | 1 |
| 10 | VEER | Receiver Ground (Common with Transmitter Ground) | 1 |

| | | | |
|----|------|--|---|
| 11 | VEER | Receiver Ground (Common with Transmitter Ground) | 1 |
| 12 | RD- | Receiver Inverted DATAout. AC Coupled | |
| 13 | RD+ | Receiver Non-inverted DATAout. AC Coupled | |
| 14 | VEER | Receiver Ground (Common with Transmitter Ground) | 1 |
| 15 | VCCR | Receiver Power Supply | |
| 16 | VCCT | Transmitter Power Supply | |
| 17 | VEET | Transmitter Ground (Common with Receiver Ground) | 1 |
| 18 | TD+ | Transmitter Non-Inverted DATAin. AC Coupled. | |
| 19 | TD- | Transmitter Inverted DATAin. AC Coupled. | |
| 20 | VEET | Transmitter Ground (Common with Receiver Ground) | 1 |

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k-10k ohms on host board to a voltage between 2.0V and 3.6V. MOD_DEF (0) pulls line low to indicate module is plugged in.
4. This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates (most likely Fiber Channel 1x and 2x Rates). If implemented, the input will be internally pulled down with > 30kΩ resistor. The input states are:
 - 1) Low (0 – 0.8V): Reduced Bandwidth
 - 2) (>0.8, < 2.0V): Undefined
 - 3) High (2.0 – 3.465V): Full Bandwidth
 - 4) Open: Reduced Bandwidth
5. LOS is open collector output should be pulled up with 4.7k-10k ohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

| Parameter | Symbol | Min. | Typical | Max | Unit | Notes |
|--------------------------------------|---------------------|----------------------|---------|-----------------|----------|------------|
| Power Consumption | P | | | 1.0 | W | commercial |
| | | | | 1.5 | | Industrial |
| Supply Current | I _{cc} | | | 300 | mA | commercial |
| | | | | 450 | | Industrial |
| Transmitter | | | | | | |
| Single-ended Input Voltage Tolerance | V _{CC} | -0.3 | | 4.0 | V | |
| Differential Input Voltage Swing | V _{in,pp} | 200 | | 2400 | mV pp | |
| Differential Input Impedance | Z _{in} | 90 | 100 | 110 | Oh m | |
| Transmit Disable Assert Time | | | | 5 | us | |
| Transmit Disable Voltage | V _{dis} | V _{CC} -1.3 | | V _{CC} | V | |
| Transmit Enable Voltage | V _{en} | V _{EE} -0.3 | | 0.8 | V | |
| Receiver | | | | | | |
| Differential Output Voltage Swing | V _{out,pp} | 500 | | 900 | mV pp | |
| Differential Output Impedance | Z _{out} | 90 | 100 | 110 | Oh m | |
| Data output rise/fall time | Tr/Tf | | 100 | | ps | 20% to 80% |
| LOS Assert Voltage | V _{losH} | V _{CC} -1.3 | | V _{CC} | V | |
| LOS De-assert Voltage | V _{losL} | V _{EE} -0.3 | | 0.8 | V | |

Optical Characteristics

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

| Parameter | Symbol | Min. | Typical | Max | Unit | Notes |
|----------------------------------|---|-------------------|---------|-------------------|------|-------|
| Transmitter | | | | | | |
| Center Wavelength | λ_c | $\lambda_c - 0.1$ | | $\lambda_c + 0.1$ | nm | 1 |
| Center Wavelength Spacing | | | 100 | | GHz | |
| Spectrum Bandwidth (RMS) | σ | | | 1 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Average Optical Power | P_{AVG} | 1 | | 6 | dBm | 2 |
| Extinction Ratio | ER | 9 | | | dB | |
| Transmitter OFF Output Power | P_{off} | | | -45 | dBm | |
| Transmitter Eye Mask | Compliant with 802.3z(class 1 laser safety) | | | | | |
| Receiver | | | | | | |
| Center Wavelength | λ_c | 1270 | | 1610 | nm | |
| Sensitivity (Average Power) | Sen. | | | -33 | dBm | 3 |
| Input Saturation Power(overload) | P_{sat} | -10 | | | dBm | |
| LOS Assert | LOSA | -41 | | | dBm | 4 |
| LOS De-assert | LOSD | | | -34 | dBm | 4 |
| LOS Hysteresis | LOSH | 0.5 | | | dB | |

Notes:

- λ_c refer to wavelength selection, and corresponds to approximately 0.8 nm.
- Measure at 2⁷-1 NRZ PRBS pattern.
- Measured with Light source 1563.86~1528.77nm, ER=9dB; BER≤1E-12 @PRBS=2⁷-1 NRZ.
- When LOS de-asserted, the RX data+/- output is High-level (fixed).

Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales staff.

| Parameter | Symbol | Min. | Max | Unit | Notes |
|---------------------------------------|----------|-------|------|------|----------------------|
| Temperature monitor absolute error | DMI_Temp | -3 | 3 | °C | Over operating temp |
| Supply voltage monitor absolute error | DMI_VCC | -0.15 | 0.15 | V | Full operating range |
| RX power monitor absolute error | DMI_RX | -3 | 3 | dB | |
| Bias current monitor | DMI_bias | -10% | 10% | mA | |
| TX power monitor absolute error | DMI_TX | -3 | 3 | dB | |

Mechanical Dimensions

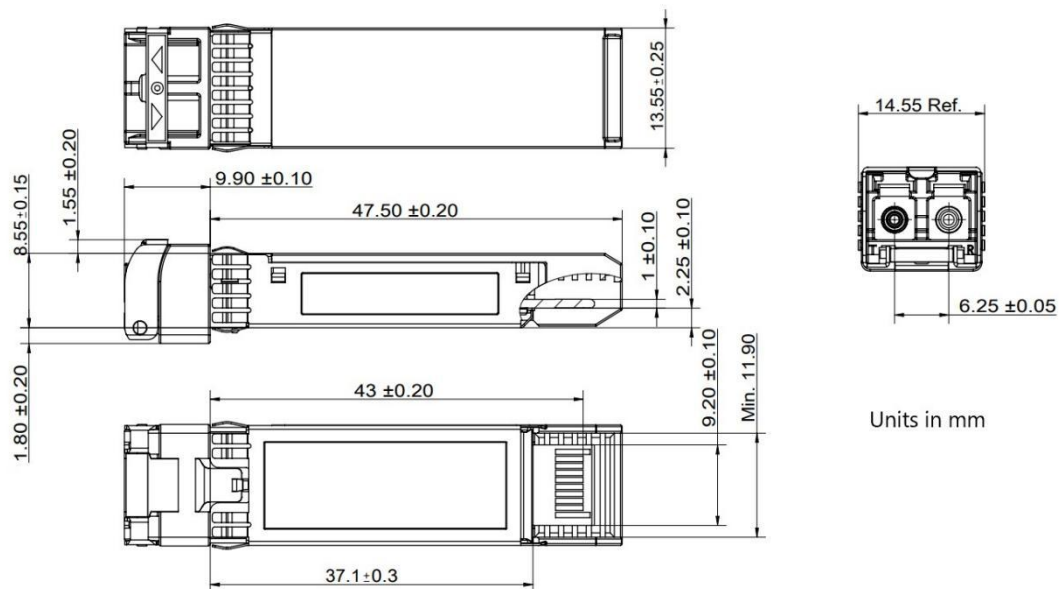


Figure2. Mechanical Outline

Compatibility Test

In order to ensure the product compatibility, our products will be tested on the switch before shipment. Our modules can be 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 S5700 Series, H3C S3100V2 Series, Juniper-EX4200, etc.



Cisco Catalyst 3850



HUAWEI S5700



H3C S3100V2



HP J9264AR



Juniper EX 4200



Alcatel 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**



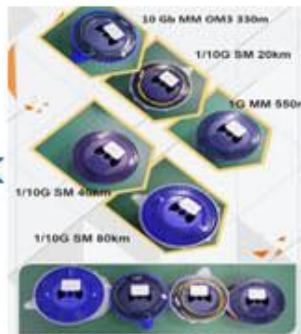
**Professional
Welding**



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.



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