

SFP+

ESPDxx92-3LCD80

10Gbps DWDM 80KM SFP+ Transceiver

- Up to 11.1Gbps Data Links
- Up to 80km transmission on SMF
- DWDM EML Laser and APD receiver
- Metal enclosure, for lower EMI
- 2-wire interface with integrated Digital Diagnostic monitoring
- Hot-pluggable SFP+ footprint
- Specifications compliant with SFF 8472
- Compliant with SFP+ MSA with LC connector
- Single 3.3V power supply
- Case operating temperature range: 0°C to 70°C
- Power dissipation < 1.5W



Applications

- 10GBASE-ZR/ZW
- 80 km 10G Fiber Channel
- 10G Ethernet with FEC

Product description

The ETU-Link ESPDxx92-3LCD80 transceivers include an APD diode and temperature stabilized DFB-EML transmitter. Digital diagnostic functions are available via an I2C. This module is designed for single mode fiber and operates at a nominal wavelength of 50GHz ITU Grid, C Band DWDM wavelength.

Product Selection

ESPDxx92-3LCD80

C-band λ_c Wavelength Guide Pin Descriptions

| Channel | Wavelength (nm) | Frequency (THZ) | Channel | Wavelength (nm) | Frequency (THZ) |
|---------|---|-----------------|---------|-----------------|-----------------|
| C13 | 1567.13 | 191.30 | C37 | 1547.72 | 193.70 |
| C14 | 1566.31 | 191.40 | C38 | 1546.92 | 193.80 |
| C15 | 1565.50 | 191.50 | C39 | 1546.12 | 193.90 |
| C16 | 1564.68 | 191.60 | C40 | 1545.32 | 194.00 |
| C17 | 1563.86 | 191.70 | C41 | 1544.53 | 194.10 |
| C18 | 1563.05 | 191.80 | C42 | 1543.73 | 194.20 |
| C19 | 1562.23 | 191.90 | C43 | 1542.94 | 194.30 |
| C20 | 1561.42 | 192.00 | C44 | 1542.14 | 194.40 |
| C21 | 1560.61 | 192.10 | C45 | 1541.35 | 194.50 |
| C22 | 1559.79 | 192.20 | C46 | 1540.56 | 194.60 |
| C23 | 1558.98 | 192.30 | C47 | 1539.77 | 194.70 |
| C24 | 1558.17 | 192.40 | C48 | 1538.98 | 194.80 |
| C25 | 1557.36 | 192.50 | C49 | 1538.19 | 194.90 |
| C26 | 1556.55 | 192.60 | C50 | 1537.40 | 195.00 |
| C27 | 1555.75 | 192.70 | C51 | 1536.61 | 195.10 |
| C28 | 1554.94 | 192.80 | C52 | 1535.82 | 195.20 |
| C29 | 1554.13 | 192.90 | C53 | 1535.04 | 195.30 |
| C30 | 1553.33 | 193.00 | C54 | 1534.25 | 195.40 |
| C31 | 1552.52 | 193.10 | C55 | 1533.47 | 195.50 |
| C32 | 1551.72 | 193.20 | C56 | 1532.68 | 195.60 |
| C33 | 1550.92 | 193.30 | C57 | 1531.90 | 195.70 |
| C34 | 1550.12 | 193.40 | C58 | 1531.12 | 195.80 |
| C35 | 1549.32 | 193.50 | C59 | 1530.33 | 195.90 |
| C36 | 1548.51 | 193.60 | C60 | 1529.55 | 196.00 |
| Non-ITU | Peak wavelength between 1528.77nm-1567.13 | | C61 | 1528.77 | 196.10 |

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-0.3 | - | Vcc+0.3 | V | |

Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|----------------------------|-------------------|------|---------|------|------|------------------|
| Case Operating Temperature | Tcase | 0 | - | 70 | °C | Without air flow |
| Power Supply Voltage | VCC | 3.14 | 3.3 | 3.47 | V | |
| Power Supply Current | ICC | - | | 450 | mA | |
| Data Rate | BR | | 10.3125 | | Gbps | |
| Transmission Distance | TD | | - | 80 | km | |
| Coupled fiber | Single mode fiber | | | | | 9/125um SMF |

Optical Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit | NOTE |
|---------------------------------------|-----------------------------|-----------------|-----|-----------------|------|------|
| Transmitter | | | | | | |
| Average Optical Power | Pout | 1 | | 3 | dBm | 1 |
| Optical Wavelength | λ_c | $\lambda_c-0.1$ | | $\lambda_c+0.1$ | nm | |
| Center Wavelength Spacing | | | 100 | | GHz | 2 |
| Optical Extinction Ratio | ER | 6.0 | | | dB | |
| Transmitter and Dispersion Penalty | TDP | | | 3.0 | dB | |
| Side mode Suppression ratio | SMSR | 30 | | | dB | |
| Average Launch Power | Poff | | | -30 | dBm | |
| Output Eye Mask | Compliant with IEEE 802.3ae | | | | | |
| Receiver | | | | | | |
| Rx Sensitivity | RSNS | | | -23 | dBm | 3 |
| Input Saturation Power (Overload) | Psat | -9 | | | dBm | |
| Wavelength Range | λ_c | 1480 | | 1580 | nm | |

| | | | | | | |
|----------------|------|-----|--|-----|-----|--|
| LOS De-Assert | LOAD | | | -26 | dBm | |
| LOS Assert | LOSA | -32 | | | dBm | |
| LOS Hysteresis | | 0.5 | | 6 | dB | |

Notes:

- 1) Output power is power coupled into a 9/125 mm single-mode fiber.
- 2) Corresponds to approximately 0.8 nm.
- 3) Measured with a PRBS $2^{31}-1$ test pattern, @10.325Gb/s, BER< 10^{-12} .

Electrical Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit | NOTE |
|--------------------------------|---------|---------|-----|----------|----------|------|
| Supply Voltage | Vcc | 3.14 | 3.3 | 3.46 | V | |
| Supply Current | Icc | | | 450 | mA | |
| Transmitter | | | | | | |
| Input differential impedance | ohm | | 100 | | Ω | 1 |
| Differential data input swing | Vin,pp | 120 | | 820 | mV | |
| Transmit Disable Voltage | VD | Vcc-1.3 | | Vcc | V | |
| Transmit Enable Voltage | VEN | Vee | | Vee+ 0.8 | V | 2 |
| TX_FAULT Voltage-High | | Vcc-1.3 | | Vcc | V | |
| TX_FAULT Voltage-Low | | Vee | | Vee+ 0.8 | V | |
| Transmit Disable Assert Time | | | | 10 | us | |
| Receiver | | | | | | |
| Differential data output swing | Vout,pp | 350 | | 850 | mV | 3 |
| Data output rise time | tr | 30 | | | ps | 4 |
| Data output fall time | tf | 30 | | | ps | 4 |
| LOS De-assert | | Vcc-1.3 | | VccHOST | V | 5 |
| LOS Assert | | Vee | | Vee+0.8 | V | 5 |

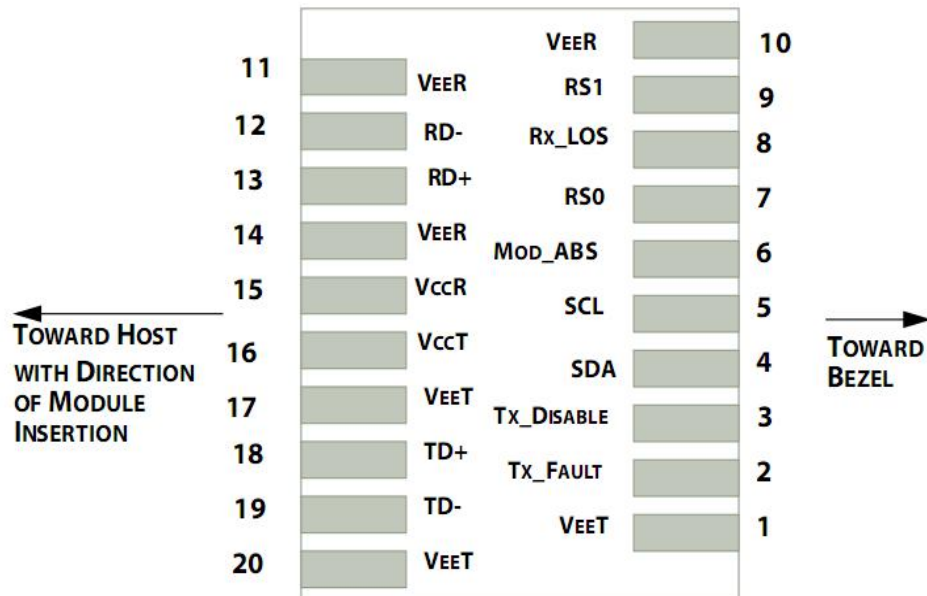
Notes:

- 1) Connected directly to TX data input pins. AC coupled thereafter.
- 2) Or open circuit.
- 3) Into 100 ohms differential termination.

- 4) These are unfiltered 20-80% values
- 5) Loss Of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

Pin Descriptions

| Pin | Symbol | Name/Description | NOTE |
|-----|-------------|--|------|
| 1 | V_{EET} | Transmitter Ground (Common with Receiver Ground) | 1 |
| 2 | T_{FAULT} | Transmitter Fault. | 2 |
| 3 | T_{DIS} | Transmitter Disable. Laser output disabled on high or open. | 3 |
| 4 | SDA | 2-wire Serial Interface Data Line | 4 |
| 5 | SCL | 2-wire Serial Interface Clock Line | 4 |
| 6 | MOD_ABS | Module Absent. Grounded within the module | 4 |
| 7 | RS0 | Rate Select 0 | 5 |
| 8 | LOS | Loss of Signal indication. Logic 0 indicates normal operation. | 6 |
| 9 | RS1 | No connection required | 1 |
| 10 | V_{EER} | Receiver Ground (Common with Transmitter Ground) | 1 |
| 11 | V_{EER} | Receiver Ground (Common with Transmitter Ground) | 1 |
| 12 | RD- | Receiver Inverted DATA out. AC Coupled | |
| 13 | RD+ | Receiver Non-inverted DATA out. AC Coupled | |
| 14 | V_{EER} | Receiver Ground (Common with Transmitter Ground) | 1 |
| 15 | V_{CCR} | Receiver Power Supply | |
| 16 | V_{CCT} | Transmitter Power Supply | |
| 17 | V_{EET} | Transmitter Ground (Common with Receiver Ground) | 1 |
| 18 | TD+ | Transmitter Non-Inverted DATA in. AC Coupled. | |
| 19 | TD- | Transmitter Inverted DATA in. AC Coupled. | |
| 20 | V_{EET} | Transmitter Ground (Common with Receiver Ground) | 1 |



Pin out of Connector Block on Host Board

Notes:

- 1) Circuit ground is internally isolated from chassis ground.
- 2) T_{FAULT} is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to $V_{\text{cc}} + 0.3\text{V}$. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
- 3) Laser output disabled on $T_{\text{DIS}} > 2.0\text{V}$ or open, enabled on $T_{\text{DIS}} < 0.8\text{V}$.
- 4) Should be pulled up with 4.7kΩ- 10kΩ host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
- 5) Internally pulled down per SFF-8431 Rev 4.1.
- 6) LOS is open collector output. It should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Digital Diagnostic Functions

ETU-Link ESPDxx92-3LCD80 transceivers support the 2-wire serial communication protocol as defined in the SFP+ MSA.

The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

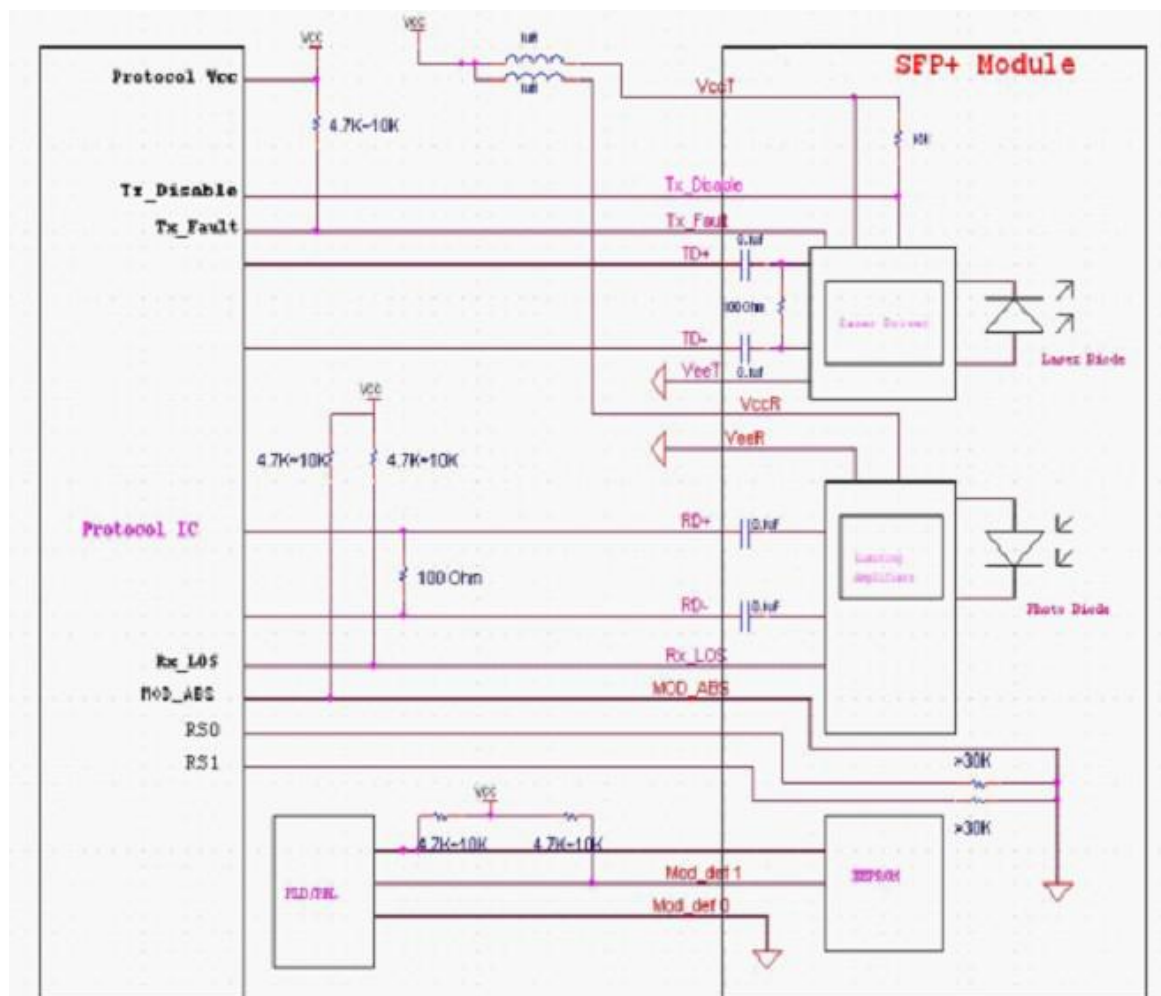
Additionally, ETU-Link SFP+ transceivers provide a unique enhanced digital diagnostic monitoring interface,

which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, and received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The SFP+ MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.

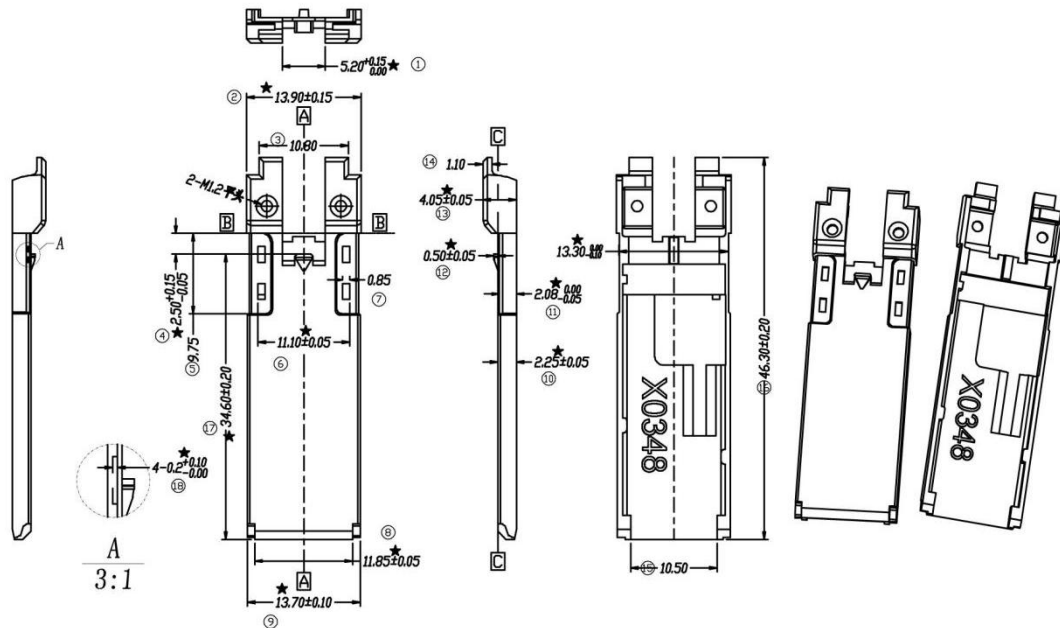
The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of the E2PROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) 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.

Host - Transceiver Interface Block Diagram



Outline Dimensions

Comply with SFF-8432 rev5.0, the improved Pluggable form factor specification.



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 |

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 S5700Series, 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.



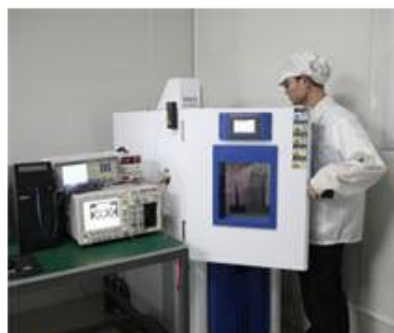
**Standardized
Production Line**



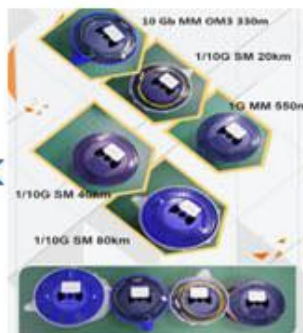
**Professional
Welding**



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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