ETU-LINK®

Optical Communication System

SFP+ Series

SFP+

ESTDxxX-3LCD80

10Gbps Tunable DWDM 80KM SFP+ Transceiver

- Supports 9.95Gb/s to 11.3Gb/s bit rates
- Monolithically integrated full C-band tunable transmitter and APD receiver
- 50 GHz ITU channel spacing with integrated wavelength locker
- Maximum link length of 80km
- Metal enclosure, for lower EMI
- 2-wire interface with integrated Digital Diagnostic monitoring
- Hot-pluggable SFP+ footprint
- Specifications compliant with SFF-8472 V11.3&SFF-8690 V1.4
- Compliant with SFP+ MSA with LC connector
- Power dissipation <1.65W
- Case temperature range: -5°C to 70°C

Applications

- DWDM 10GBASE-ZR/ZW 10G Ethernet
- DWDM 80KM 10G Fiber Channel
- DWDM SONET OC-192&SDH STM-64

Description

The ETU-Link tunable 10Gb/s SFP+ tunable transceiver is an integrated fiber optic transceiver that provides a high-speed serial link at signaling rates from 9.95 Gb/s to 11.3 Gb/s. The module complies with the 10 Gigabit Enhanced Small Form Factor Pluggable (SFP+) multisource agreement-MSA (SFF-8431) andSFF-8432，SFF-8690，SFF 8472. It complies with the ITU-T G.698.1 standard with 50 GHz channel spacing for SONET/SDH, IEEE DWDM 10GBASE-ZR for 80 km reach (Ethernet), and DWDM 10G FC for 80 km reach (Fiber Channel) applications.

The transceiver integrates the receiver and transmitter path on one module. The transceiver contains a C-band-tunable integrated Mach-Zehnder (MZ) laser, enabling data transmission over single-mode fiber through an industry-standard LC connector. On the receiver side, the 10 Gb/s data stream is recovered from an APD/ trans-impedance amplifier, and passed to an output driver. This module features a hot-pluggable electrical interface.

Wavelength Guide Descriptions

Channel	Wavelength (nm)	Frequency(THZ)	Channel	Wavelength (nm)	Frequency (THZ)
1	1568.36	191.15	51	193.65	1548.11
2	1567.95	191.20	52	193.70	1547.72
3	1567.54	191.25	53	193.75	1547.32
4	1567.13	191.30	54	193.80	1546.92
5	1566.72	191.35	55	193.85	1546.52
6	1566.31	191.40	56	193.90	1546.12
7	1565.90	191.45	57	193.95	1545.72
8	1565.50	191.50	58	194.00	1545.32
9	1565.09	191.55	59	194.05	1544.92
10	1564.68	191.60	60	194.10	1544.53
11	1564.27	191.65	61	194.15	1544.13
12	1563.86	191.70	62	194.20	1543.73
13	1563.45	191.75	63	194.25	1543.33
14	1563.05	191.80	64	194.30	1542.94
15	1562.64	191.85	65	194.35	1542.54
16	1562.23	191.90	66	194.40	1542.14
17	1561.83	191.95	67	194.45	1541.75
18	1561.42	192.00	68	194.50	1541.35
19	1561.01	192.05	69	194.55	1540.95
20	1560.61	192.10	70	194.60	1540.56
21	1560.20	192.15	71	194.65	1540.16
22	1559.79	192.20	72	194.70	1539.77
23	1559.39	192.25	73	194.75	1539.37
24	1558.98	192.30	74	194.80	1538.98
25	1558.58	192.35	75	194.85	1538.58
26	1558.17	192.40	76	194.90	1538.19
27	1557.77	192.45	77	194.95	1537.79
28	1557.36	192.50	78	195.00	1537.40
29	1556.96	192.55	79	195.05	1537.00
30	1556.55	192.60	80	195.10	1536.61
31	1556.15	192.65	81	195.15	1536.22
32	1555.75	192.70	82	195.20	1535.82

33	1555.34	192.75	83	195.25	1535.43
34	1554.94	192.80	84	195.30	1535.04
35	1554.54	192.85	85	195.35	1534.64
36	1554.13	192.90	86	195.40	1534.25
37	1553.73	192.95	87	195.45	1533.86
38	1553.33	193.00	88	195.50	1533.47
39	1552.93	193.05	89	195.55	1533.07
40	1552.52	193.10	90	195.60	1532.68
41	1552.12	193.15	91	195.65	1532.29
42	1551.72	193.20	92	195.70	1531.90
43	1551.32	193.25	93	195.75	1531.51
44	1550.92	193.30	94	195.80	1531.12
45	1550.52	193.35	95	195.85	1530.72
46	1550.12	193.40	96	195.90	1530.33
47	1549.72	193.45	97	195.95	1529.94
48	1549.32	193.50	98	196.00	1529.55
49	1548.91	193.55	99	196.05	1529.16
50	1548.51	193.60			

Note:

1. When a tunable module is plugged in for the first time, it will go to a default channel, ESTDxxX-3LCD80 default channel is 1568.36nm, compatible with channel range from 1 to 99.
2. When the module is power cycled it will automatically go to the last channel selected, or when Tx_Disable asserted and then re-enabled, the module returns to the last channel selected.

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	NOTE
Storage Temperature	Ts	-40	-	85	ºC	
Relative Humidity	RH	5	-	85	%	
Power Supply Voltage	VCC	-0.3	-	3.6	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	-5	-	70	ºC	Without air flow
Power Supply Voltage	VCC	3.14	3.3	3.47	V	
Power Supply Current	ICC	-		500	mA	
Data Rate	BR		10.3125		Gbps	
Transmission Distance	TD		-	80	km	
Coupled fiber	Single mode fiber					9/125um SMF

Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	NOTE
Supply Voltage	Vcc	3.14	3.3	3.46	V	
Supply Current	Icc			500	mA	
Transmitter						
Input differential impedance	ohm		100		Ω	1
Differential data input swing	Vin,pp	240		910	mV	
Transmit Disable Voltage	Vdis	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	
Receiver						
Differential data output swing	Vout,pp	350		800	mV	3
Data output rise time	tr	30			ps	4
Data output fall time	tf	30			ps	4
LOS Fault		Vcc–1.3		V_{CCHOST}	V	5
LOS Normal		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

Loss of Signal is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	NOTE
Transmitter						
Average Optical Power	Pout	-1		3	dBm	1
Frequency stability (BOL)		fc –1.5		fc +1.5	GHz	2
Frequency stability (EOL)		fc –2.5		fc +2.5	GHz	2
Center Wavelength Spacing			50		GHz	3
Optical Extinction Ratio	ER	8.2			dB	
Sidemode Suppression ratio	SMSR	35			dB	
Average Launch Power(Laser off)	Poff			-30	dBm	
Output Eye Mask	Compliant with IEEE 802.3ae					
Receiver						
Rx Sensitivity with dispersion 0 ps/nm	RSENS			-23	dBm	@9.95, 10.3, 10.5Gbps，BER=10^-12
				-27		@10.709Gbps,BER=10^-4
				-27		@11.1Gbps, BER=10^-4
				-26.5		@11.3Gbps, BER=10^-4
Rx Sensitivity with dispersion –400 to +1450 ps/nm				-21		@9.95, 10.3, 10.5Gbps，BER=10^-12
				-25		@10.709Gbps,BER=10^-4
				-25		@11.1Gbps, BER=10^-4
				-24		@11.3Gbps, BER=10^-4
Input Saturation Power (Overload)	Psat	-9			dBm	
Wavelength Range	λ_C	1480		1580	nm	
LOS De-Assert	LOSD			-27	dBm	
LOS Assert	LOSA	-36			dBm	
LOS Hysteresis		0.5			dB	

Notes:

1. Output power is power coupled into a 9/125 mm single-mode fiber.
2. fc refer to Page 2 the Frequency row of ESTDxxX-3LCD80Wavelength Guide Table，and test condition is reflect power to

transmitter lower than -27dBm.

3. Corresponds to approximately 0.4 nm.

Pin Assignment

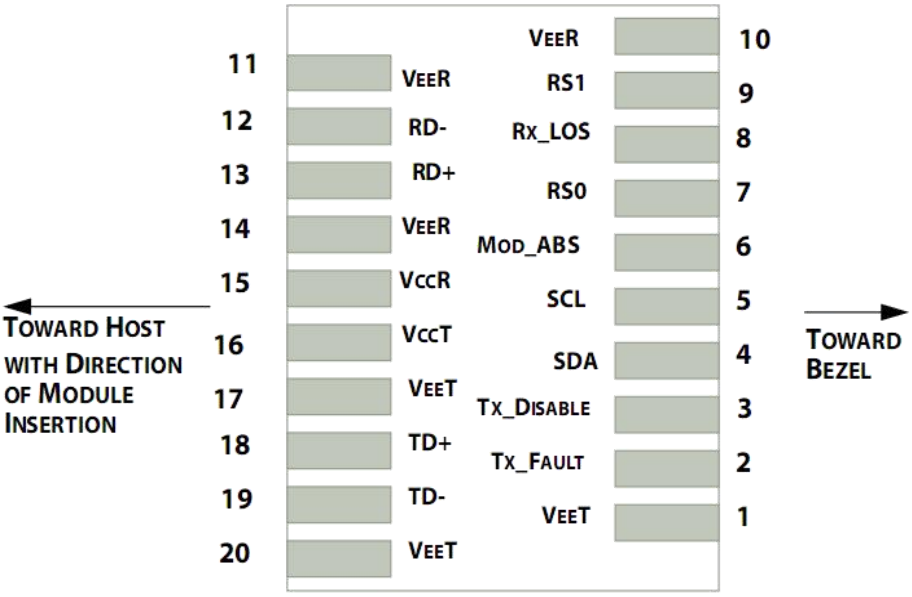


Diagram of Host Board Connector Block Pin Numbers and Name

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

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 Vcc + 0.3V.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_{DIS}>2.0V or open, enabled on T_{DIS}<0.8V.
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

As defined by the SFP+ MSA, ETU-LINK SFP+ 80km tunable transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

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

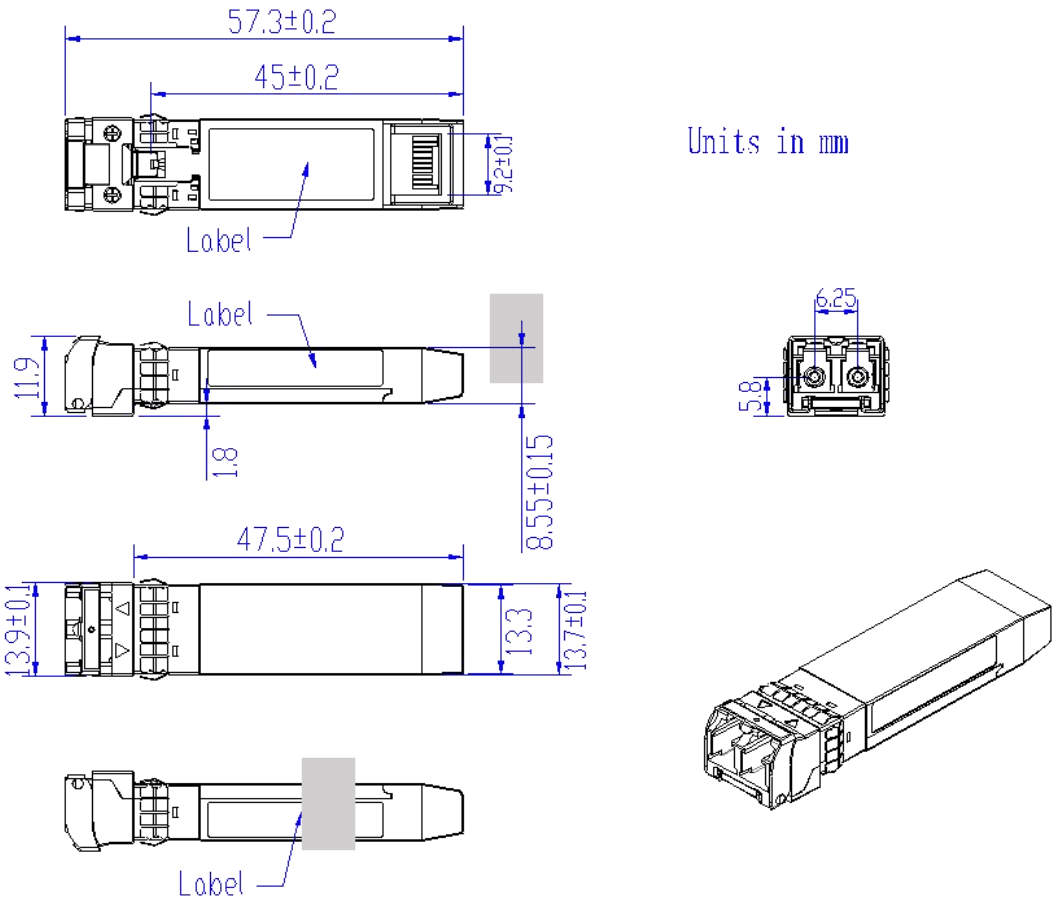
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller 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 SFP+ transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the SFP+ 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 SFP+ MSA Specification.

Mechanical Specifications

ETU-LINK's SFP+ transceivers are compliant with the dimensions defined by the SFP+ Multi-Sourcing Agreement (MSA).



SFP+ Transceiver (dimensions are in mm)

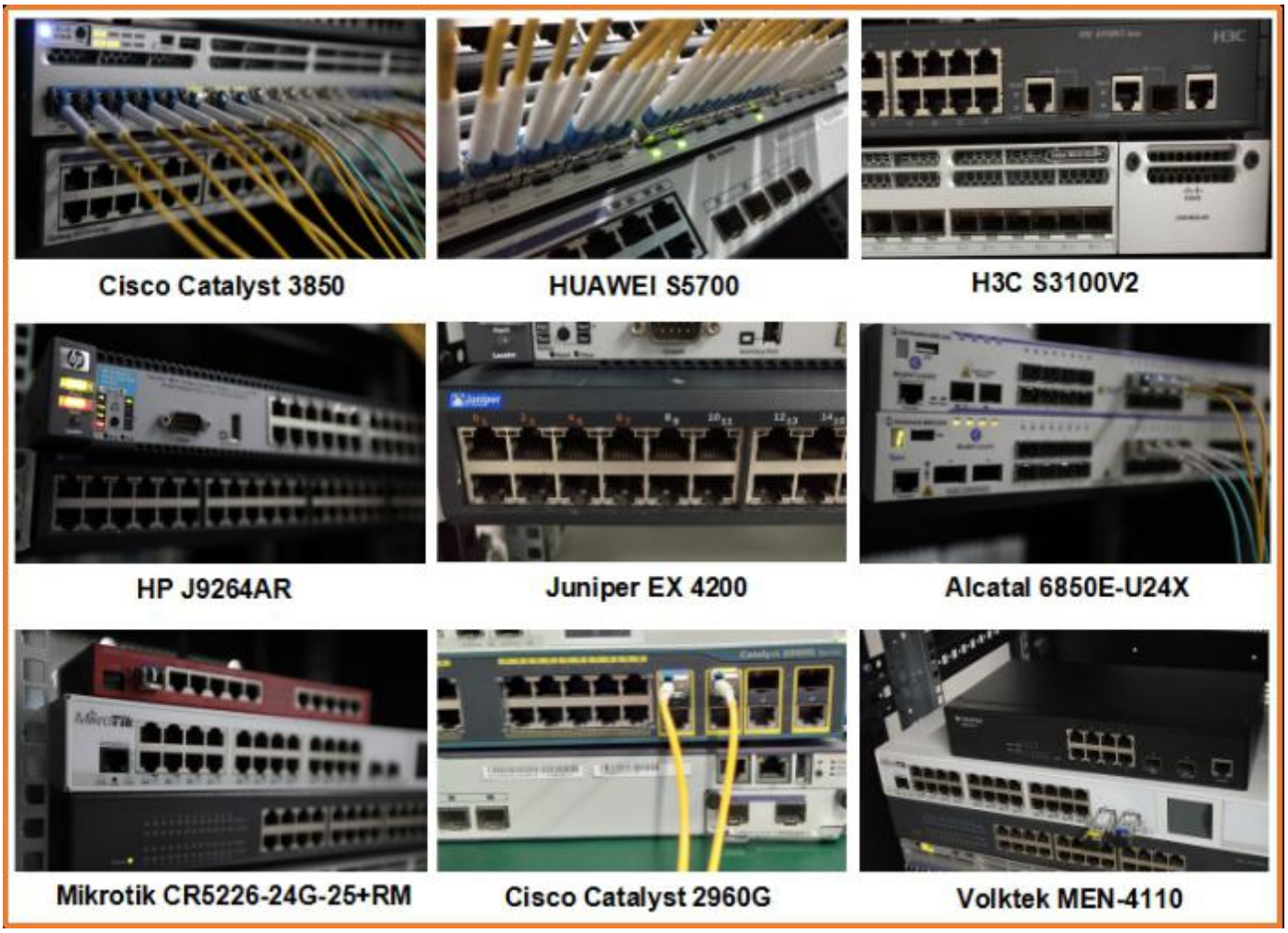
Regulatory Compliance

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 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.



Product Production Process

Quality Assurance

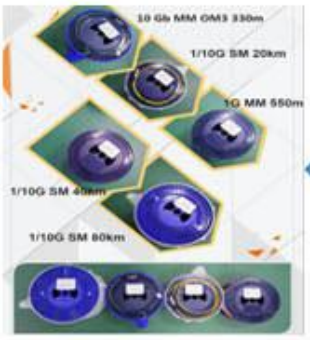
Continuous introduction of new equipment, produced by strict standards, strict quality inspection, to guarantee the high quality standard of each product.

Standardized Production Line

Professional Welding

Assembling

Cleaning end face



Distance Testing

Aging Testing

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: 4th Floor, C Building, JinBoLong Industrial Park, QingQuan Road, LongHua District, Shenzhen city, GuangDong
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.