SFP Series

ETU-LINK
Optical Communication System

SFP

ESB5424-3LCD120

2.488Gbps SFP Bi-Directional Transceiver, 120KM Reach Tx1550nm/Rx1490nm

➢ Dual data-rate of 2.488Gbps/2.125Gbps operation

➢ 1550nm DFB laser and APD photodetector for 120KM transmission

➢ Compliant with SFP MSA and SFF-8472 with simplex LC or SC receptacle

➢ Digital Diagnostic Monitoring:
Internal Calibration or External Calibration

➢ Compatible with SONET OC-48 system

➢ Compatible with RoHS

➢ +3.3V single power supply

➢ Operating case temperature range of
0°C to +70°C (Commercial)
-40°C to +85°C (Industrial)

Applications

➢ SDH STM-16 and SONET OC-48 system

➢ Fiber Channel

➢ Switch to Switch interface

➢ Switched backplane applications

➢ Router/Server interface

➢ Other optical transmission systems

Description

The SFP-BIDI transceivers are high performance, cost effective modules supporting dual data-rate of 2.488Gbps/2.125Gbps and 120KM transmission distance with SMF.

The transceiver consists of three sections: a DFB laser transmitter, anAPD photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.

Module Block Diagram
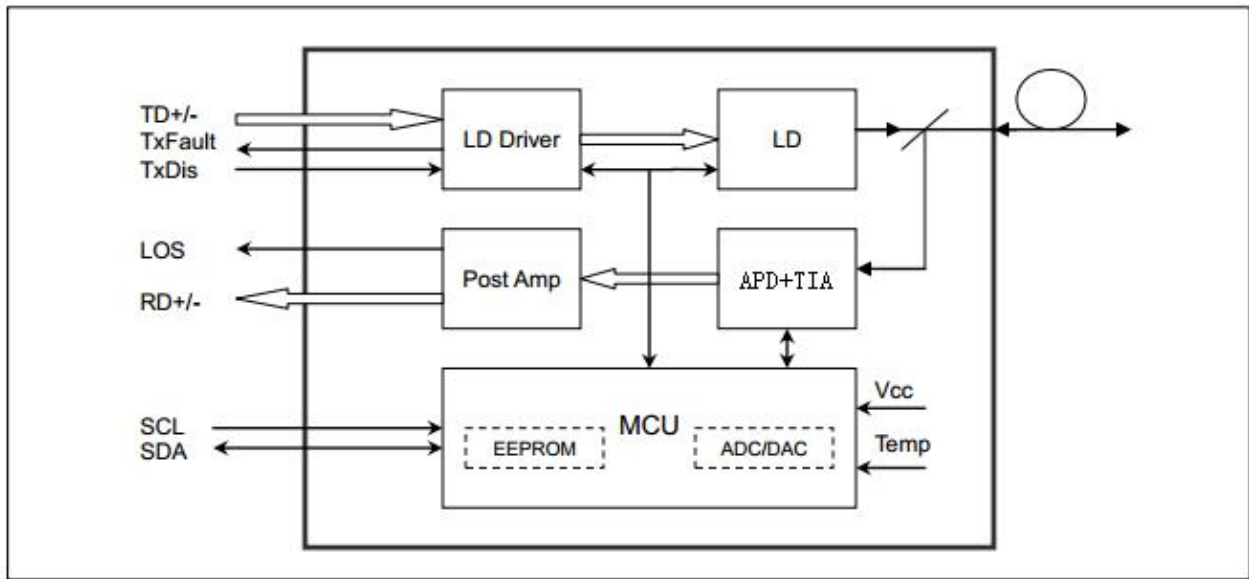
Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		4.7	V	
Storage Temperature	TS	-40		85	°C	
Case Operating Temperature	TOP	0		70	°C	

Electrical Input / Output Characteristics

Transmitter

Parameter		Symbol	Min.	Typ	Max.	Unit	Note
Diff. input voltage swing			120		820	mVpp	1
Tx Disable input	H	VIH	2.0		Vcc+0.3	V	
	L	VIL	0		0.8		
Tx Fault output	H	VOH	2.0		Vcc+0.3	V	2
	L	VOL	0		0.8		
Input Diff. Impedance		Zin		100		Ω	

Receiver

Parameter		Symbol	Min.	Typ	Max.	Unit	Note
Diff. output voltage swing			340	650	800	mVpp	3
Rx LOS Output	H	VOH	2.0		Vcc+0.3	V	2
	L	VOL	0		0.8		

Note 1) TD+/- are internally AC coupled with 100Ω differential termination inside the module.

Note 2) Tx Fault and Rx LOS are open collector outputs, which should be pulled up with 4.7k to 10kΩ resistors on the host board. Pull up voltage between 2.0V and Vcc+0.3V.

Note 3) RD+/- outputs are internally AC coupled, and should be terminated with 100Ω (differential) at the user SERDES

Optical Characteristics

Transmitter

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Operating Wavelength	λC	1530	1550	1570	nm	
Ave. output power (Enabled)	Po	1		5	dBm	1
Extinction Ratio	ER	10			dB	1
RMS spectral width	Δλ			4	nm	
Rise/Fall time (20%~80%)	Tr/Tf			0.26	ps	2
Output Eye Mask	Telcordia GR-253-CORE and ITU-T G.957 compatible					

Note (1): Measure at $2^{23}-1$ NRZ PRBS pattern

Note (2): Transmitter eye mask definition

Receiver

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Operating Wavelength		1470		1510	nm	
Sensitivity	Psen			-30	dBm	1
Min. overload	Pimax	-9			dBm	
LOS Assert	Pa	-40			dBm	
LOS De-assert	Pd			-32	dBm	2
LOS Hysteresis	Pd-Pa	0.5		6	dB	

Note (1): Measured with Light source 1550nm(1490nm), ER=10dB; BER =<10^{-12} @PRBS=$2^{23}-1$ NRZ.

Note (2): When LOS de-asserted, the RX data+/- output is signal output.

Pin Definitions and Functions

PIN	Name	Function	Notes
1	VeeT	Tx ground	
2	Tx Fault	Tx fault indication, Open Collector Output, active "H"	1
3	Tx Disable	LVTTL Input, internal pull-up, Tx disabled on "H"	2
4	MOD-DEF2	2 wire serial interface data input/output (SDA)	3
5	MOD-DEF1	2 wire serial interface clock input (SCL)	3
6	MOD-DEF0	Model present indication	3
7	Rate select	No connection	
8	LOS	Rx loss of signal, Open Collector Output, active "H"	4
9	VeeR	Rx ground	
10	VeeR	Rx ground	
11	VeeR	Rx ground	
12	RD-	Inverse received data out	5
13	RD+	Received data out	5
14	VeeR	Rx ground	
15	VccR	Rx power supply	
16	VccT	Tx power supply	
17	VeeT	Tx ground	
18	TD+	Transmit data in	6
19	TD-	Inverse transmit data in	6
20	VeeT	Tx ground	

Note 1) When high, this output indicates a laser fault of some kind. Low indicates normal operation. And it should be pulled up with a 4.7 – 10KΩ resistor on the host board.

Note 2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10KΩ resistor. Its states are:

    Low (0 – 0.8V): Transmitter on   (>0.8, < 2.0V): Undefined

    High (2.0V~Vcc+0.3V): Transmitter Disabled Open: Transmitter Disabled

Note 3) Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7K – 10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.

    Mod-Def 0 has been grounded by the module to indicate that the module is present
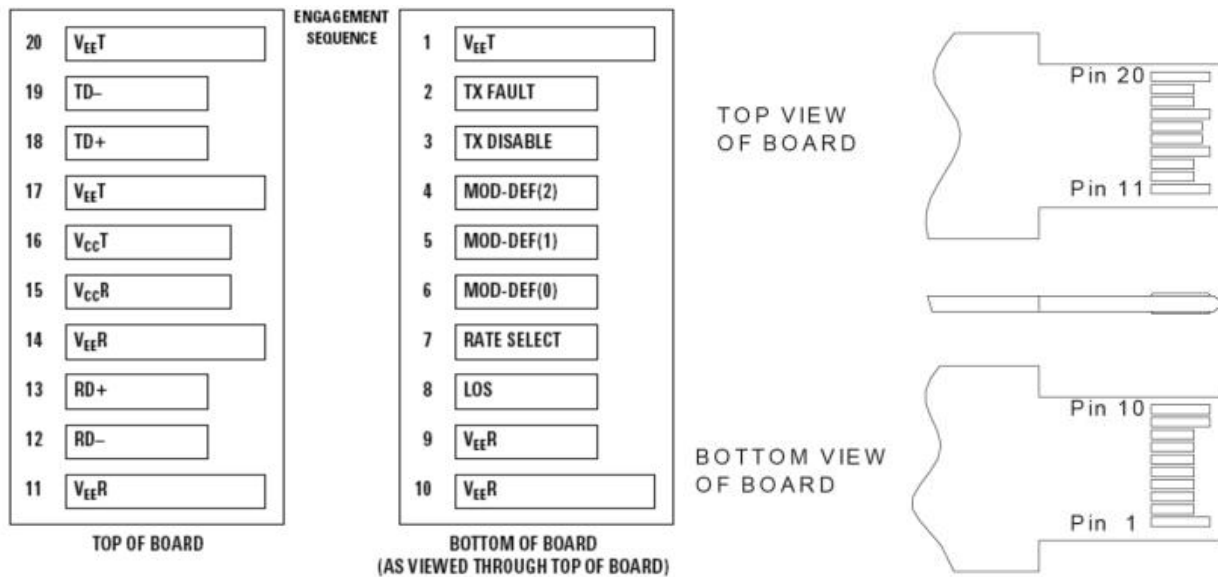
    Mod-Def 1 is the clock line of two wire serial interface for serial ID

    Mod-Def 2 is the data line of two wire serial interface for serial ID

Note 4) When high, this output indicates loss of signal (LOS). Low indicates normal operation.

Note 5) RD+/-: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.

Note 6) TD+/-: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

TOP OF BOARD		ENGAGEMENT SEQUENCE	BOTTOM OF BOARD (AS VIEWED THROUGH TOP OF BOARD)	
20	V$_{EE}$T		1	V$_{EE}$T
19	TD–		2	TX FAULT
18	TD+		3	TX DISABLE
17	V$_{EE}$T		4	MOD-DEF(2)
16	V$_{CC}$T		5	MOD-DEF(1)
15	V$_{CC}$R		6	MOD-DEF(0)
14	V$_{EE}$R		7	RATE SELECT
13	RD+		8	LOS
12	RD–		9	V$_{EE}$R
11	V$_{EE}$R		10	V$_{EE}$R

TOP VIEW OF BOARD

Pin 20
Pin 11

BOTTOM VIEW OF BOARD

Pin 10
Pin 1

Electrical Interface Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.15	3.3	3.6	V	
Supply Current	Icc		185	280	mA	
Transmitter						
Input differential impedance	Rin		100		Ω	1
Single ended data input swing	Vin,pp	250		1200	mV	
Transmit Disable Voltage	VD	Vcc–1.3		Vcc	V	
Transmit Enable Voltage	VEN	Vee		Vee+ 0.8	V	2
Transmit Disable Assert Time				10	us	
Receiver						
Single ended data output swing	Vout,pp	250		800	mV	3
Data output rise time	tr		100	175	ps	4
Data output fall time	tf		100	175	ps	4
LOS Fault	VLOS fault	Vcc–0.5		VccHOST	V	5
LOS Normal	VLOS norm	Vee		Vee+0.5	V	5
Power Supply Rejection	PSR	100			mVpp	6

Notes:

1. Connected directly to TX data input pins. AC coupled thereafter.

2. Or open circuit.

3. Into 100 ohms differential termination.

4. 20 – 80 %

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

6. Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

Digital Diagnostic Functions

ETU-LINK'S ESB5424-3LCD120 transceivers support the 2-wire serial communication protocol as defined in the SFP MSA. It is very closely related to the E2PROM defined in the GBIC standard, with the same electrical specifications.

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 allowsreal-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, 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 E2PROM that is accessible over a 2-wire serial interface at the 8bit 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 interface is identical to, and is thus fully backward compatible with both the GBIC Specification and the SFP Multi Source Agreement.

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. Digital diagnostics for the ESB5424-3LCD120 are internally calibrated by default.

Typical Interface Circuit
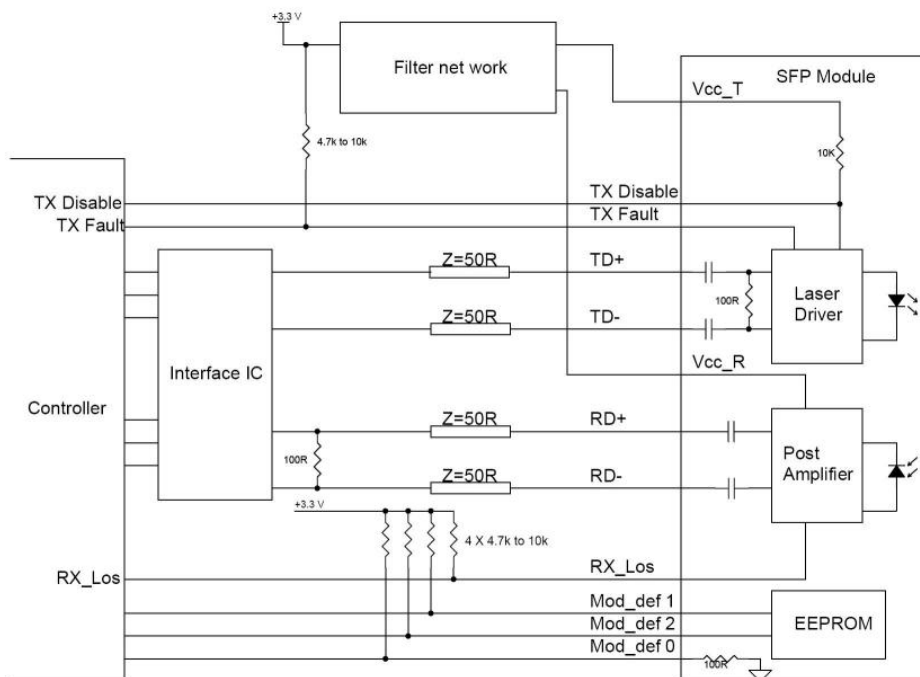
Mechanical Specifications

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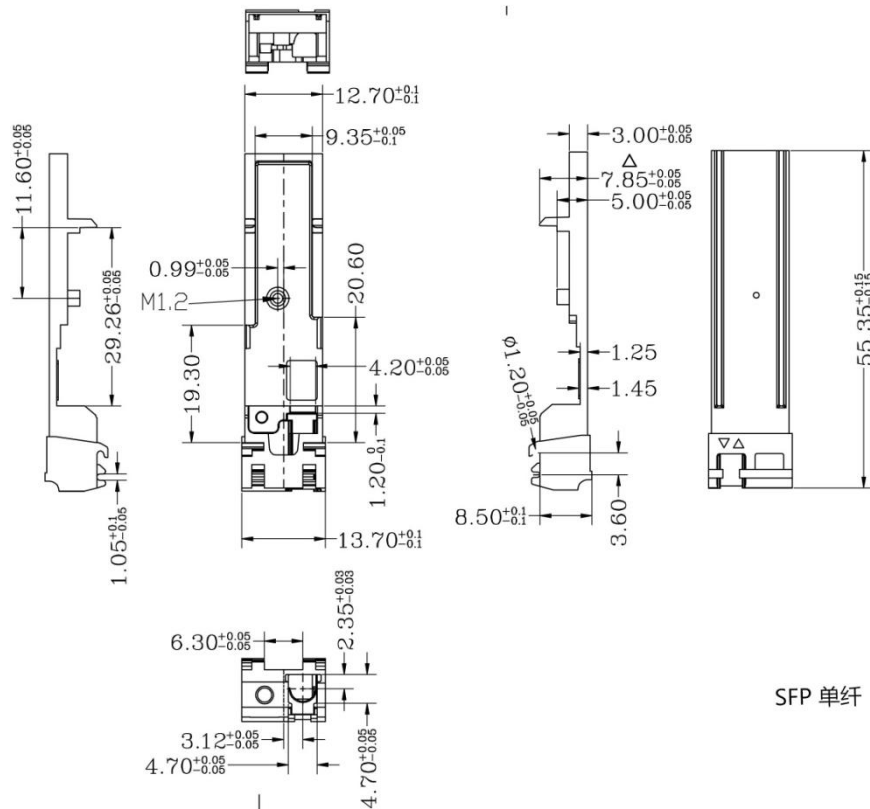
Regulatory Compliance

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

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.
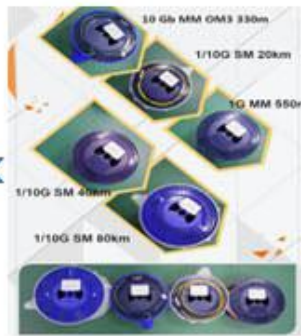

Standardized Production Line

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.

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