

## SFP

### ESB3503-3SCD3

#### 155Mbps SFP Bi-Directional Transceiver, 3KM Reach Tx1310nm/Rx1550nm

- Up to 155Mbps data-rate
- 1310nm FP laser and 1550nm PIN photodetector for 3km transmission
- Compliant with SFP MSA and SFF-8472 with simplex SC receptacle
- Digital Diagnostic Monitoring:  
Internal Calibration or External Calibration
- 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-1, S-1.1,L-1.1, L-1.2
- SONET OC-3 IR1,LR1,LR2
- Other optical links

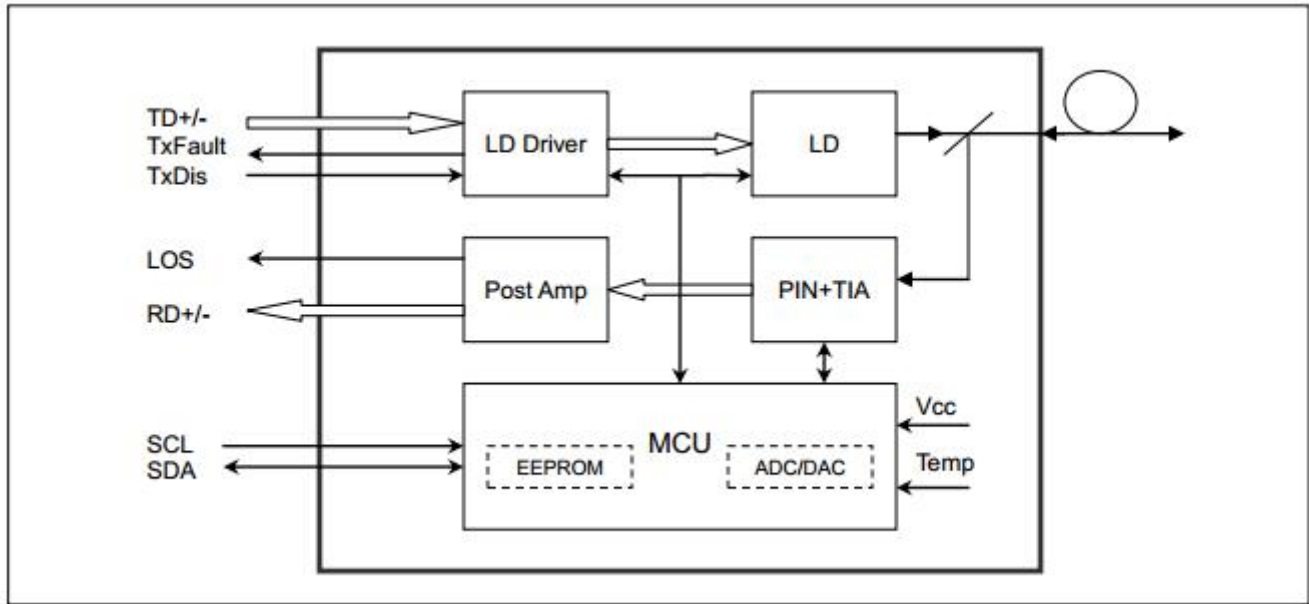
## Description

The SFP-BIDI transceivers are high performance, cost effective modules supporting data-rate of 155Mbps and 3km transmission distance with SMF.

The transceiver consists of three sections: a FP laser transmitter, a PIN 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		

**Notes:**

- 1) TD+/- are internally AC coupled with 100Ω differential termination inside the module.
- 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.
- 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	1270	1310	1360	nm	
		1500	1550	1570		
Ave. output power (Enabled)	Po	-14		-8	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					

**Notes:**

- 4) Measure at 2<sup>23</sup>-1 NRZ PRBS pattern
- 5) Transmitter eye mask definition

### Receiver

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Operating Wavelength		1530	1550	1570	nm	
		1270	1310	1360		
Sensitivity	Psen			-28	dBm	1
Min. overload	Pimax	-3			dBm	
LOS Assert	Pa	-45			dBm	
LOS De-assert	Pd			-34	dBm	2
LOS Hysteresis	Pd-Pa	0.5		6	dB	

**Notes:**

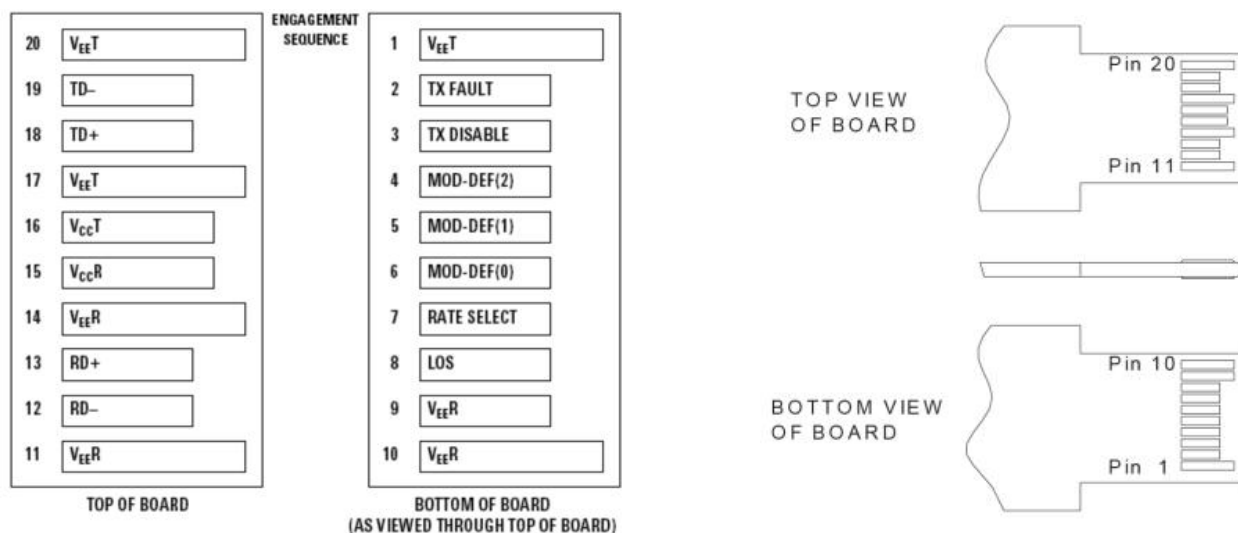
- 6) Measured with Light source 1550nm (1310nm), ER=10dB; BER =<10<sup>-12</sup> @PRBS=2<sup>23</sup>-1 NRZ.
- 7) When LOS de-asserted, the RX data+/- output is signal output.

## Pin Descriptions

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	

- 8) When high, this output indicates a laser fault of some kind. Low indicates normal operation. And should be pulled up with a 4.7 – 10K $\Omega$  resistor on the host board.
- 9) 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 – 10K $\Omega$  resistor. It's states are:
  - 10) Low (0 – 0.8V): Transmitter on ( $>0.8, < 2.0V$ ): Undefined
  - 11) High (2.0V~Vcc+0.3V): Transmitter Disabled Open: Transmitter Disabled
- 12) Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7K – 10K $\Omega$  resistor on the host board. The pull-up voltage shall be VccT or VccR.
- 13) Mod-Def 0 has been grounded by the module to indicate that the module is present
- 14) Mod-Def 1 is the clock line of two wire serial interface for serial ID
- 15) Mod-Def 2 is the data line of two wire serial interface for serial ID
- 16) When high, this output indicates loss of signal (LOS). Low indicates normal operation.
- 17) RD+/-: These are the differential receiver outputs. They are AC coupled 100 $\Omega$  differential lines which should be terminated with 100 $\Omega$  (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.
- 18) TD+/-: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 $\Omega$  differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.



## Electrical Interface Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	V <sub>cc</sub>	3.15	3.3	3.6	V	
Supply Current	I <sub>cc</sub>		185	280	mA	
<b>Transmitter</b>						
Input differential impedance	R <sub>in</sub>		100		Ω	1
Single ended data input swing	V <sub>in,pp</sub>	250		1200	mV	
Transmit Disable Voltage	VD	V <sub>cc</sub> -1.3		V <sub>cc</sub>	V	
Transmit Enable Voltage	VEN	V <sub>ee</sub>		V <sub>ee</sub> + 0.8	V	2
Transmit Disable Assert Time				10	us	
<b>Receiver</b>						
Single ended data output swing	V <sub>out,pp</sub>	250		800	mV	3
Data output rise time	t <sub>r</sub>		100	175	ps	4
Data output fall time	t <sub>f</sub>		100	175	ps	4
LOS Fault	VLOS fault	V <sub>cc</sub> -0.5		V <sub>cc</sub> HOS T	V	5
LOS Normal	VLOS norm	V <sub>ee</sub>		V <sub>ee</sub> +0.5	V	5
Power Supply Rejection	PSR	100			mVpp	6

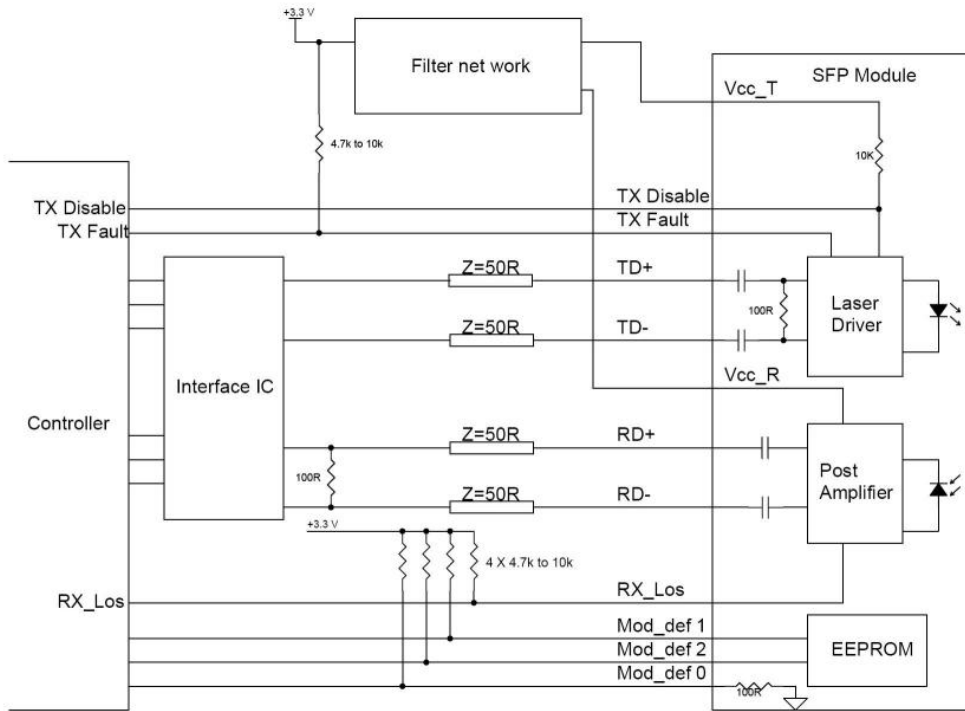
### Notes:

- 19) Connected directly to TX data input pins. AC coupled thereafter.
- 20) Or open circuit.
- 21) Into 100 ohms differential termination.
- 22) 20 – 80 %
- 23) Loss of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
- 24) 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.

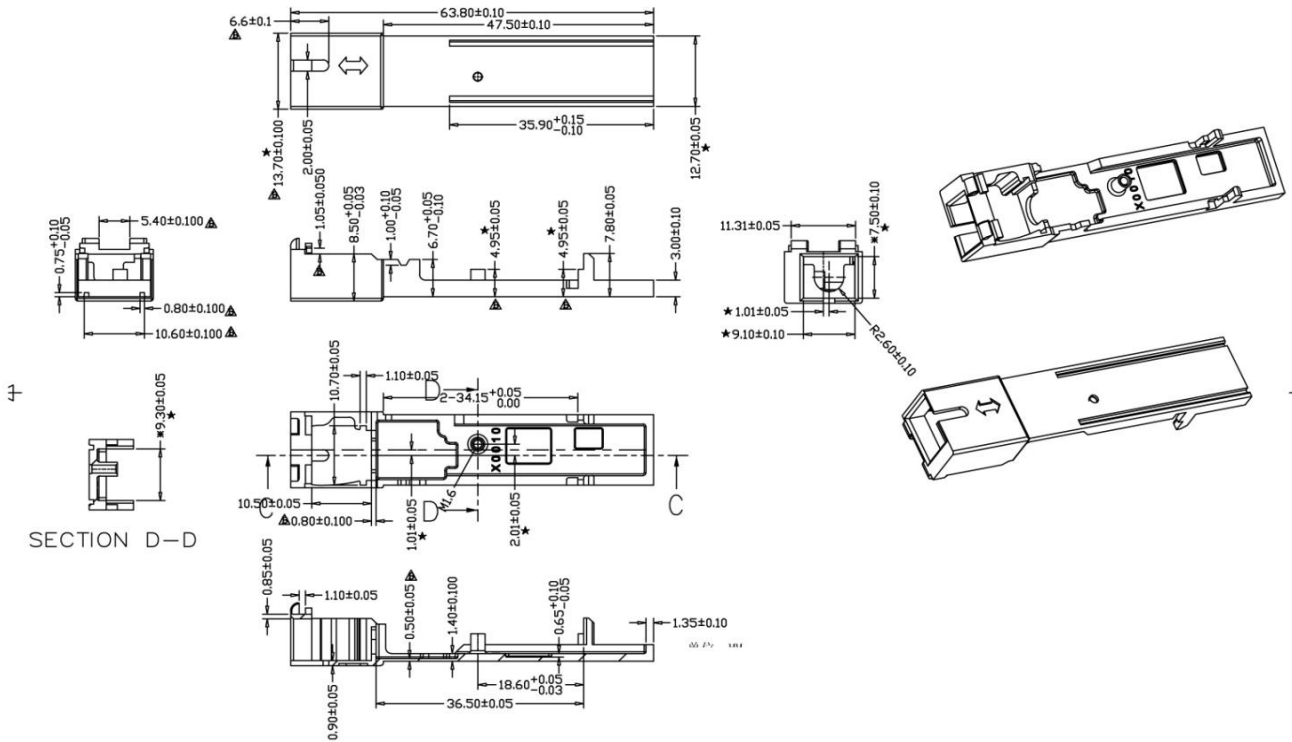
## Diagnostics Specification

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70 -40 to +85	°C	±3°C	Internal/ External
Voltage	3.0 to 3.6	V	±3%	Internal/ External
Bias Current	2 to 80	mA	±10%	Internal/ External
TX Power	-16to -8	dBm	±3dB	Internal/ External
RX Power	-33 to 0	dBm	±3dB	Internal/ External

# Mechanical Specifications



# Package Dimensions



## 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



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**



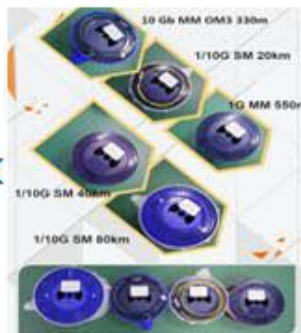
**Professional  
Welding**



**Assembling**



**Aging Testing**



**Distance Testing**



**Cleaning end face**



**Product Initial Test**



**Switch Testing**

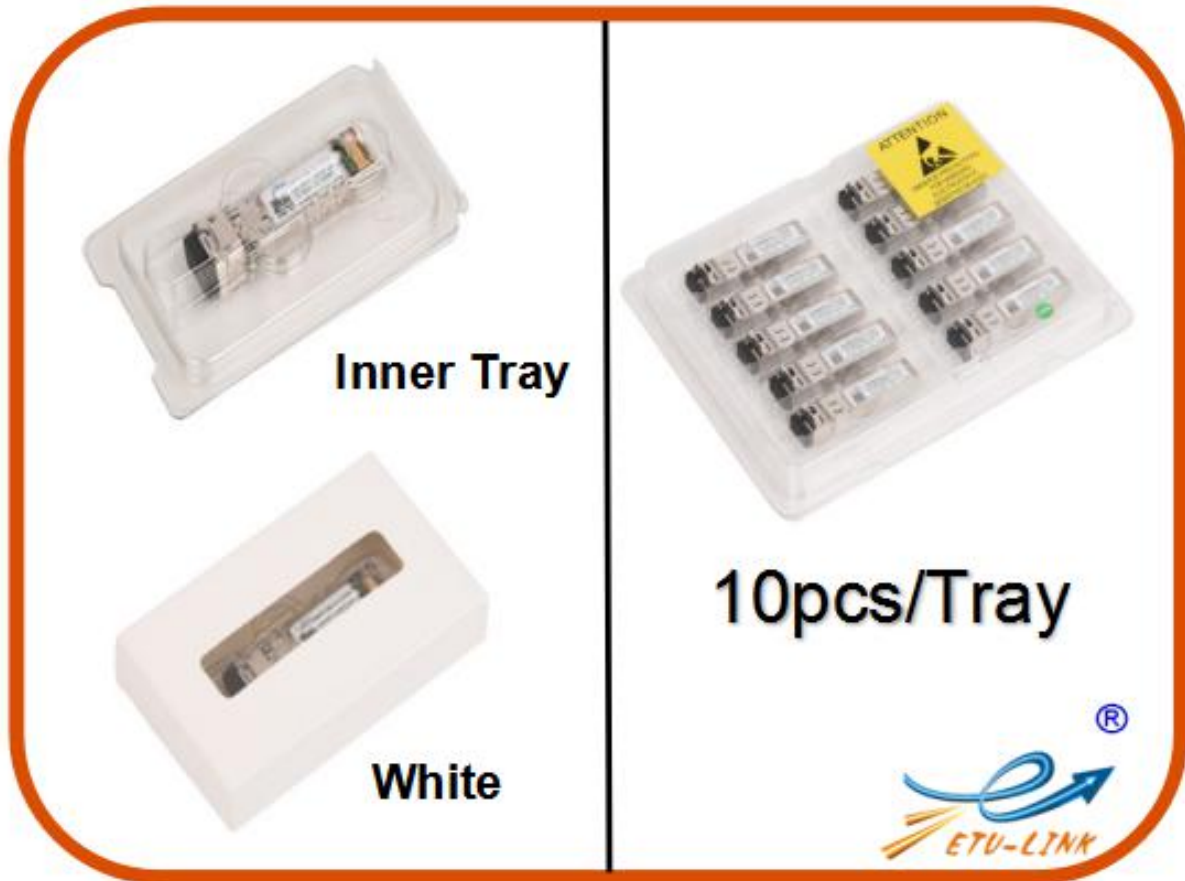


**Product Final Test**



## Packaging

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



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