



## SPT-PBXXG-X10/20D

### 1.25Gbps SFP Bi-Directional Transceiver, 10km or 20km Reach

1310nm TX / 1550 nm RX & 1550nm TX / 1310 nm RX

1310nm TX / 1490 nm RX & 1490nm TX / 1310 nm RX



#### Features

- Dual data-rate of 1.25Gbps/1.063Gbps operation
- 1310nm FP or 1490/1550nm DFB laser and PIN photo detector for 20km 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-24-LR-1
- Compatible with ROHS
- +3.3V single power supply
- The SFP support the optical Ethernet interface with a symmetric speed of 1000 Mbps, and must meet the following requirements:
- Compatible with the patch cords ITU G.652D, G.657A and G.657B (in the impact part) and the core/cladding of bidirectional transmission on single-mode optical fiber is 9/125  $\mu\text{m}$ .
- "Hot plug" with LC type optical interface connector.
- 4Comply with 1000Base-BX20 based on IEEE802.3ah standard, and the allowable range is up to 20km.
- The SFP have automatic gain control so that it can be installed within 5 meters of the maximum range (the maximum attenuation supported according to the sensitivity of the receiver) without



using an attenuator.

- Comply with digital diagnosis monitoring interface.
- Comply with CE and FCC certification.
- Operating case temperature:

Standard: 0 to +70°C

Industrial: -40 to +85°C

## Applications

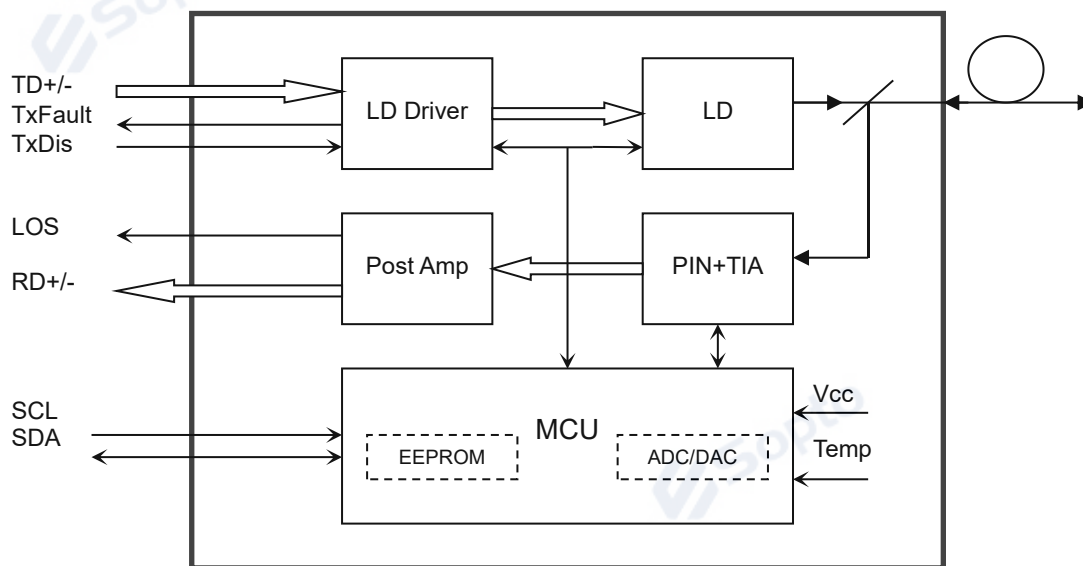
- Gigabit Ethernet
- Fiber Channel
- Switch to Switch interface
- Switched backplane applications
- Router/Server interface
- Other optical transmission systems

## Description

The SFP-BIDI transceivers are high performance, cost effective modules supporting dual data-rate of 1.25Gbps/1.0625Gbps and 20km transmission distance with SMF.

The transceiver consists of three sections: a DFB 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.



**Absolute Maximum Ratings**

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.5	4.5	V
Storage Temperature	Ts	-40	+85	°C
Operating Humidity	-	5	85	%

**Recommended Operating Conditions**

Parameter		Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Standard	Tc	0		+70	°C
Power Supply Voltage		Vcc	3.13	3.3	3.47	V
Power Supply Current		Icc			170	mA
Data Rate	Gigabit Ethernet			1.25		Gbps
	Fiber Channel			1.063		

**Optical and Electrical Characteristics**

Parameter		Symbol	Min	Typical	Max	Unit	Notes
Transmitter							
Centre Wavelength	$\lambda_c$		1290	1310	1330	nm	1310nm TX
			1470	1490	1510	nm	1490nm TX
			1530	1550	1570	nm	1550nm TX
Spectral Width (RMS)	$\Delta\lambda$				1	nm	
Side Mode Suppression Ratio	SMSR		30			dB	
Average Output Power	Pout		-9		-3	dBm	1
Extinction Ratio	ER		9			dB	
Optical Rise/Fall Time (20%~80%)	tr/tf				0.26	ns	
Data Input Swing Differential	V <sub>IN</sub>		400		1800	mV	2
Input Differential Impedance	Z <sub>IN</sub>		90	100	110	$\Omega$	
TX Disable	Disable		2.0		Vcc	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		Vcc	V	
	Normal		0		0.8	V	



Receiver						
Receiver Sensitivity				-24	dBm	3
Receiver Overload		-1			dBm	3
LOS De-Assert	LOS <sub>D</sub>			-26	dBm	
LOS Assert	LOS <sub>A</sub>	-36			dBm	
LOS Hysteresis		1		4	dB	
Data Output Swing Differential	V <sub>out</sub>	400		1800	mV	4
LOS	High	2.0		V <sub>cc</sub>	V	
	Low			0.8	V	

Notes:

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 2<sup>7</sup>-1 test pattern @1250Mbps, BER ≤1×10<sup>-12</sup>.
4. Internally AC-coupled.

### Timing and Electrical

Parameter	Symbol	Min	Typical	Max	Unit
TX Disable Negate Time	t <sub>on</sub>			1	ms
TX Disable Assert Time	t <sub>off</sub>			10	μs
Time To Initialize, including Reset of TX Fault	t <sub>init</sub>			300	ms
TX Fault Assert Time	t <sub>fault</sub>			100	μs
TX Disable To Reset	t <sub>reset</sub>	10			μs
LOS Assert Time	t <sub>loss_on</sub>			100	μs
LOS De-assert Time	t <sub>loss_off</sub>			100	μs
Serial ID Clock Rate	f <sub>serial_clock</sub>			400	KHz
MOD_DEF (0:2)-High	VH	2		V <sub>cc</sub>	V
MOD_DEF (0:2)-Low	VL			0.8	V

### Diagnostics

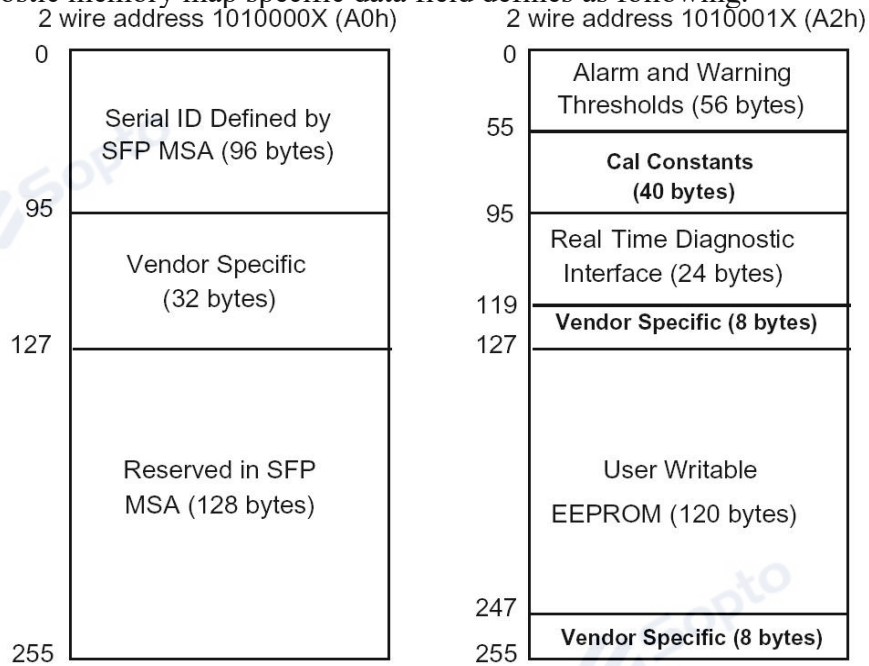
Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External
TX Power	-9 to -3	dBm	±3dB	Internal / External
RX Power	-26 to -1	dBm	±3dB	Internal / External



The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

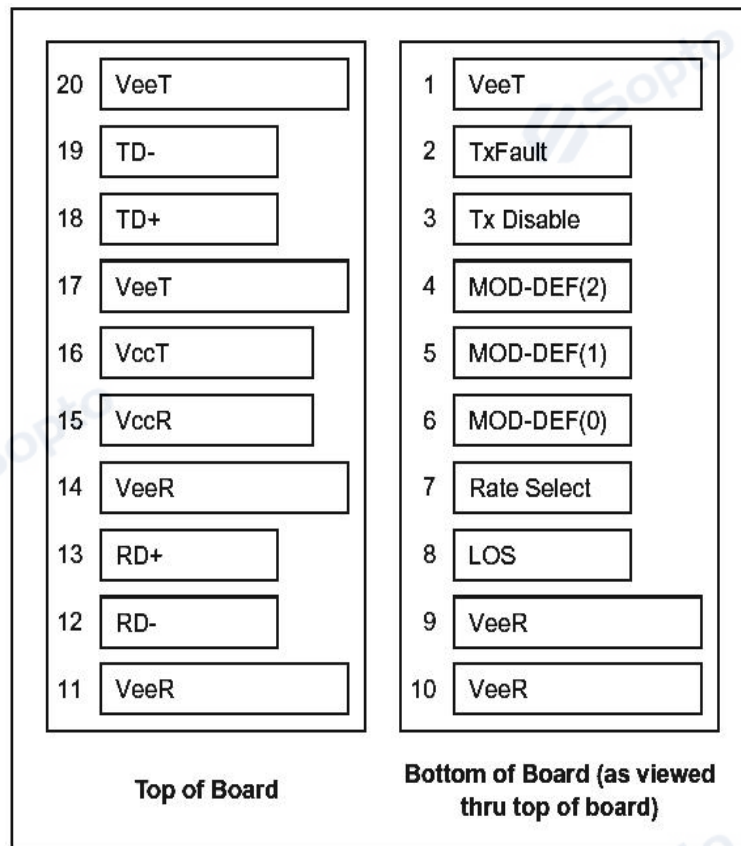
The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



## Pin Definitions

### Pin Diagram



## Pin Descriptions

Pin	Signal Name	Description	Plug Seq.	Notes
1	V <sub>EET</sub>	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	MOD_DEF(2)	SDA Serial Data Signal	3	Note 3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3
6	MOD_DEF(0)	TTL Low	3	Note 3
7	Rate Select	Not Connected	3	
8	LOS	Loss of Signal	3	Note 4
9	V <sub>EER</sub>	Receiver ground	1	
10	V <sub>EER</sub>	Receiver ground	1	
11	V <sub>EER</sub>	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 5
13	RD+	Received Data Out	3	Note 5
14	V <sub>EER</sub>	Receiver ground	1	
15	V <sub>CCR</sub>	Receiver Power Supply	2	
16	V <sub>CCT</sub>	Transmitter Power Supply	2	
17	V <sub>EET</sub>	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 6
19	TD-	Inv. Transmit Data In	3	Note 6
20	V <sub>EET</sub>	Transmitter Ground	1	



## Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.

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 4.7k~10kΩ resistor. Its states are:

Low (0 to 0.8V): Transmitter on

(>0.8V, < 2.0V): Undefined

High (2.0 to 3.465V): Transmitter Disabled

Open: Transmitter Disabled

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 is 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

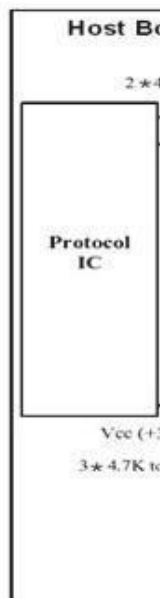
Mod-Def 2 is the data line of two wire serial interface for serial ID

4) LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and Vcc+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.

5) RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.

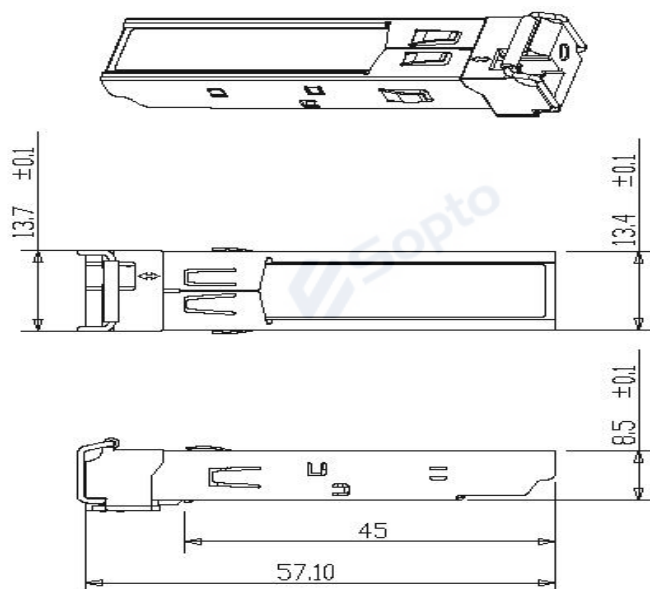
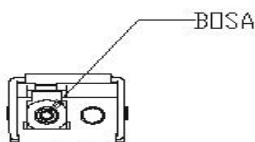
6) TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

## Recommended Interface Circuit



## Mechanical

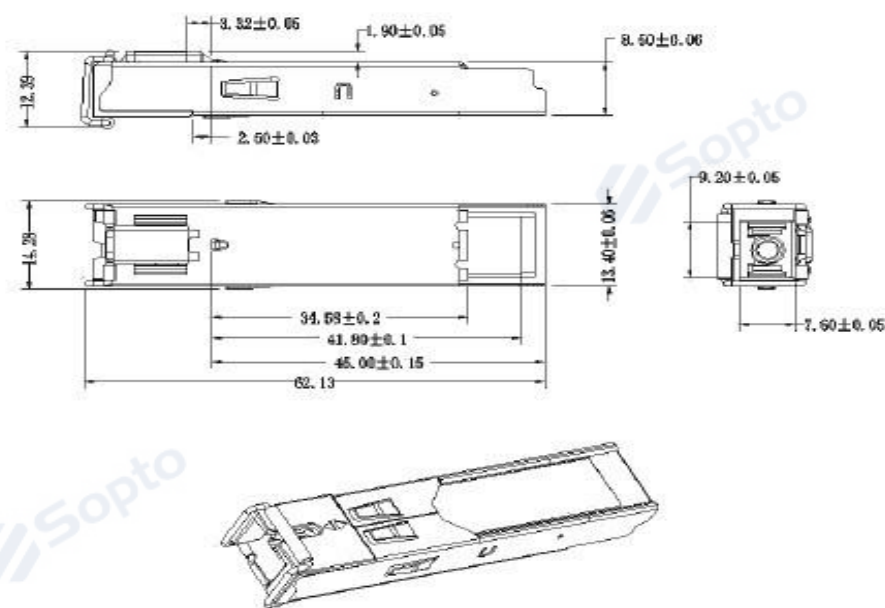
A . LC  
Receptacle







Unit:mm

**B. SC Receptacle**

Unit:mm

**Ordering information**

Part Number	Product Description
1310nm TX / 1550 nm RX	
SPT-PB351G-L10D	1310nm Tx, 1.25Gbps, LC, 10km, 0°C~+70°C, With DDM
SPT-PB351G-S10D	1310nm Tx, 1.25Gbps, SC, 10km, 0°C~+70°C, With DDM
SPT-PB351G-L20D	1310nm Tx, 1.25Gbps, LC, 20km, 0°C~+70°C, With DDM





SPT-PB351G-S20D	1310nm Tx, 1.25Gbps, SC, 20km, 0°C~+70°C, With DDM
SPT-PB351G-L10TD	1310nm Tx, 1.25Gbps, LC, 10km, -40°C~+85°C, With DDM
SPT-PB351G-L20TD	1310nm Tx, 1.25Gbps, LC, 20km, -40°C~+85°C, With DDM
1550nm TX / 1310 nm RX	
SPT-PB531G-L10D	1550nm Tx, 1.25Gbps, LC, 10km, 0°C ~ +70°C, With DDM
SPT-PB531G-S10D	1550nm Tx, 1.25Gbps, SC, 10km, 0°C ~ +70°C, With DDM
SPT-PB531G-L20D	1550nm Tx, 1.25Gbps, LC, 20km, 0°C ~ +70°C, With DDM
SPT-PB531G-S20D	1550nm Tx, 1.25Gbps, SC, 20km, 0°C ~ +70°C, With DDM
SPT-PB531G-L10TD	1550nm Tx, 1.25Gbps, LC, 10km, -40°C~+85°C, With DDM
SPT-PB531G-L20TD	1550nm Tx, 1.25Gbps, LC, 20km, -40°C~+85°C, With DDM

Part Number	Product Description
1310nm Tx/1490nm Rx	
SPT-PB341G-L10D	1310nm Tx, 1.25Gbps, SC, 10km, 0°C ~ +70°C, DDM
SPT-PB341G-S10D	1310nm Tx, 1.25Gbps, SC, 10km, 0°C ~ +70°C, DDM
SPT-PB341G-L20D	1310nm Tx, 1.25Gbps, LC, 20km, 0°C ~ +70°C, DDM
SPT-PB341G-S20D	1310nm Tx, 1.25Gbps, SC, 20km, 0°C ~ +70°C, DDM
SPT-PB341G-L10TD	1310nm Tx, 1.25Gbps, SC, 10km, -40°C~+85°C, DDM
SPT-PB341G-L20TD	1310nm Tx, 1.25Gbps, LC, 20km, -40°C~+85°C, DDM
1490nm Tx/1310nm Rx	
SPT-PB431G-L10D	1490nm Tx, 1.25Gbps, LC, 10km, 0°C ~ +70°C, DDM
SPT-PB431G-S10D	1490nm Tx, 1.25Gbps, SC, 10km, 0°C ~ +70°C, DDM
SPT-PB431G-L20D	1490nm Tx, 1.25Gbps, LC, 20km, 0°C ~ +70°C, DDM
SPT-PB431G-L20TD	1490nm Tx, 1.25Gbps, LC, 20km, -40°C~+85°C, DDM
SPT-PB431G-L10TD	1490nm Tx, 1.25Gbps, LC, 20km, -40°C~+85°C, DDM

Note:

- 1、 Default operating case temperature is 0 ~ 70°C. If you need -40 ~85°C products, please contact us.
- 2、 If you need more customized services, please contact us.

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