

# SP28-BDxxxx10x

## SFP28 25Gb/s Bi-Directional 10km Transceiver

### PRODUCT FEATURES

- Up to 25.78Gbps Data Links
- Up to 10km transmission on SMF
- Single LC receptacle, Bi-directional
- DFB Laser and PIN receiver
- A Type: 1270nm TX/1330nm RX
- B Type: 1330nm TX/1270nm RX
- Build-in dual CDR , for lower EMI
- Digital diagnostics functions are available via the I2C Interface
- Hot-pluggable SFP28 footprint
- Specifications compliant with SFF 8472
- Compliant with SFF-8402 with LC connector
- Single 3.3V power supply
- Power dissipation < 1.2W
- Case operating temperature:
  - Commercial: 0°C to +70°C
  - Extended: -10°C to +85°C
  - Industrial: -40°C to +85°C

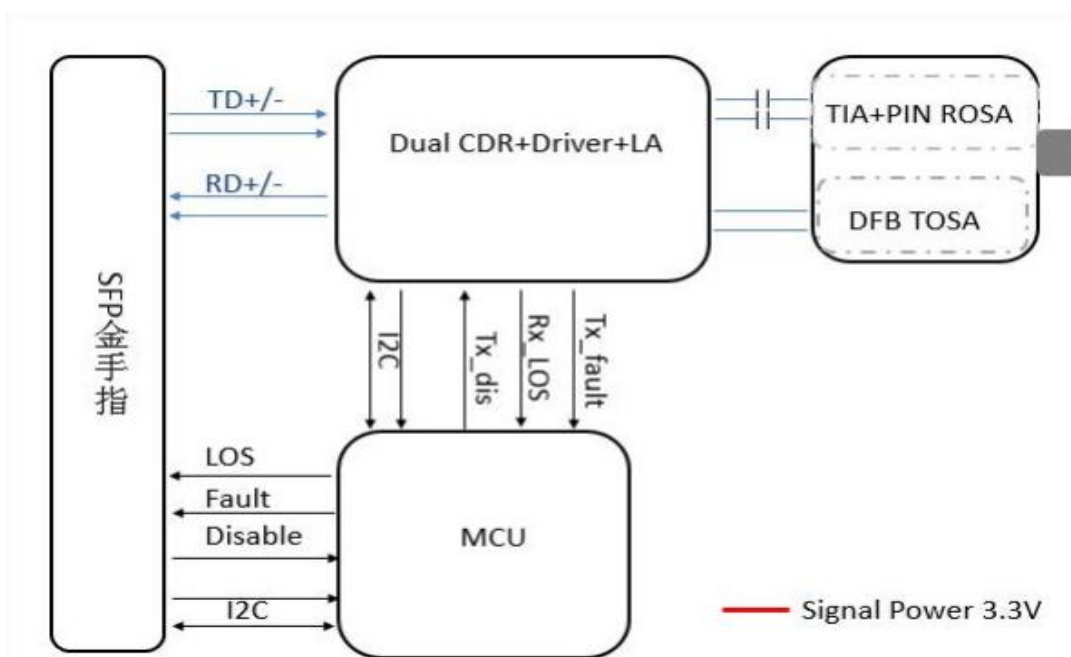


### APPLICATIONS

- 25GBASE-LR Ethernet
- eCPRI and CPRI

## PRODUCT DESCRIPTION

The Photonics Valley's SP28-BDXXXX10X is designed for Bi-directional 25G serial optical data communications by using DFB laser transmitter and PIN receiver. It is a high performance module for 25G Ethernet and Option 10 CPRI applications which operate up to 10km. This module incorporates Photonics Valley's proven circuit and technology to provide reliable long life, high performance, and consistent service.



## Ordering information

Product part Number	Data Rate (Gbps)	Media	Wavelength (nm)	Transmission Distance(km)	Temperature Range T <sub>case</sub> /°C	
SP28-BD273310C	25.78	Single mode fiber	1270nm/1330nm	10	0~70	Commercial
SP28-BD273310I	25.78	Single mode fiber	1270nm/1330nm	10	-40~85	Industrial
SP28-BD273310E	25.78	Single mode fiber	1270nm/1330nm	10	-10~85	Extended
SP28-BD332710C	25.78	Single mode fiber	1270nm/1330nm	10	0~70	Commercial
SP28-BD332710I	25.78	Single mode fiber	1270nm/1330nm	10	-40~85	Industrial
SP28-BD332710E	25.78	Single mode fiber	1270nm/1330nm	10	-10~85	Extended

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature	$T_s$	-40	-	85	°C	
Relative Humidity	$R_H$	5	-	95	%	
Power Supply Voltage	$V_{CC}$	0	-	3.6	V	

## Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	$T_{case}$	0	-	70	°C	SP28-BDxxxx10C
		-10		85	°C	SP28-BDxxxx10E
		-40		85	°C	SP28-BDxxxx10I
Power Supply Voltage	$V_{CC}$	3.14	3.3	3.47	V	
Power Supply Current	$I_{CC}$	-		363	mA	
Data Rate	BR		25.78		Gbps	
Transmission Distance	TD			10	km	
Coupled fiber	Single mode fiber					9/125um SMF

## Optical Characteristics

(DFB TX:1270nm/ PIN RX1330nm)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Average Launched Power	$P_O$	-3.0		+3.0	dBm	
Average Launched Power(Laser Off)	$P_{off}$	-	-	-30	dBm	
Center Wavelength Range	$\lambda_C$	1260	1270	1280	nm	
Spectrum Bandwidth(-20dB)	$\Delta\lambda$	-	-	1	nm	
Side-Mode Suppression Ratio	SMSR	30	-	-	dB	
Transmitter Reflectance				-12	dB	
Extinction Ratio	ER	3.5		-	dB	Note (1)
Output Eye Mask	Compliant with IEEE 802.3cc					Note (2)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Receiver</b>						
Input Optical Wavelength	$\lambda_{IN}$	1320	1330	1340	nm	
Receiver Sensitivity (Average power)	$P_{sen}$	-	-	-13.0	dBm	Note (3)
Input Saturation Power (Overload)	$P_{SAT}$	2.0	-	-	dBm	Note (3)
Los Of Assert	$LOSS_A$	-30	-	-13	dBm	
Los Of De-assert	$LOSS_D$	-	-	-12	dBm	
LOS -Hysteresis	$P_{Hys}$	0.5			dB	

( DFB TX:1330nm/ PIN RX1270nm)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Average Launched Power	$P_O$	-3.0		+3.0	dBm	
Average Launched Power(Laser Off)	$P_{off}$	-	-	-30	dBm	
Center Wavelength Range	$\lambda_C$	1320	1330	1340	nm	
Spectrum Bandwidth(-20dB)	$\Delta\lambda$	-	-	1	nm	
Side-Mode Suppression Ratio	SMSR	30	-	-	dB	
Transmitter Reflectance				-12	dB	
Extinction Ratio	ER	3.5		-	dB	Note (1)
Output Eye Mask	Compliant with IEEE 802.3cc					Note (2)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Receiver</b>						
Input Optical Wavelength	$\lambda_{IN}$	1260	1270	1280	nm	
Receiver Sensitivity (Average power)	$P_{sen}$	-	-	-13.0	dBm	Note (3)
Input Saturation Power (Overload)	$P_{SAT}$	2.0	-	-	dBm	Note (3)
Los Of Assert	$LOSS_A$	-30	-	-13	dBm	
Los Of De-assert	$LOSS_D$	-	-	-12	dBm	
LOS -Hysteresis	$P_{Hys}$	0.5			dB	

Note (1): Measured with a PRBS  $2^{31}-1$  test pattern, @25.78Gb/s.

Note (2): Transmitter eye mask definition, Compliant with IEEE 802.3cc.

Note (3): Receiver sensitivity is defined at BER  $\leq 5 \times 10^{-5}$  level. not  $10^{-12}$  level

## Electrical Interface Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Transmitter Fault Output-High	$V_{FaultH}$	2	-	$V_{cc}+0.3$	V	
Transmitter Fault Output-Low	$V_{FaultL}$	0	-	0.8	V	
Transmitter Disable Voltage- High	$V_{DisH}$	2	-	$V_{cc}+0.3$	V	
Transmitter Disable Voltage- low	$V_{DisL}$	0	-	0.8	V	
<b>Receiver</b>						
LOS Output Voltage-High	$V_{LOSH}$	2	-	$V_{cc}+0.3$	V	
LOS Output Voltage-Low	$V_{LOSL}$	0	-	0.8	V	

## Pin Description

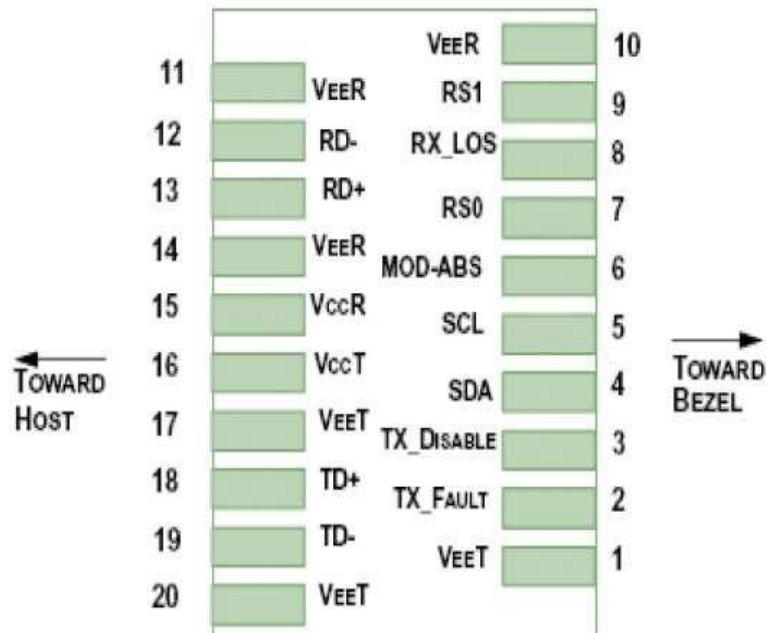


Diagram of Host Board Connector Block Pin Numbers and Name

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, internal pull down	5
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	6
9	RS1	Rate Select 1, internal pull down	5
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:

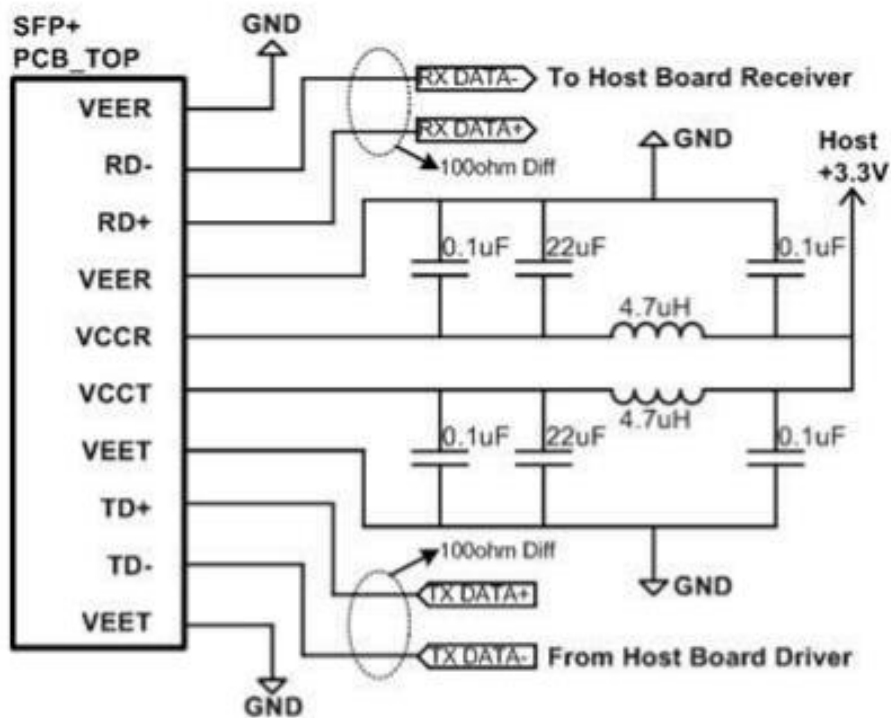
1. Circuit ground is internally isolated from chassis ground.
2.  $T_{FAULT}$  is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to  $V_{CC} + 0.3V$ . A high output indicates a transmitter 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. Rate select can also be set through the 2-wire bus in accordance with SFF-8472. Rx Rate Select is set at Bit 3, Byte 110, Address A2h. Tx Rate Select is set at Bit 3, Byte 118, Address A2h.
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.

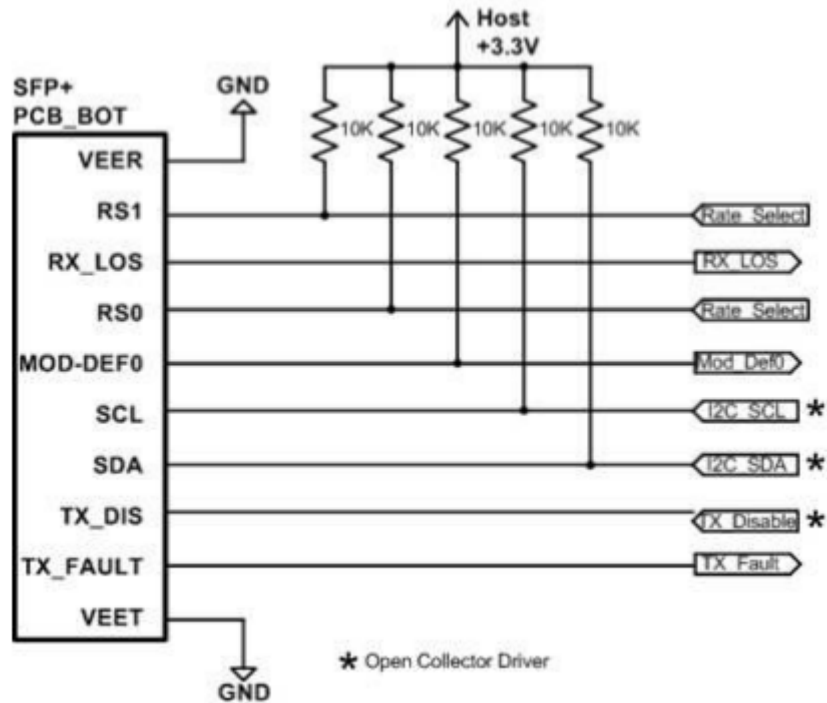
## Digital Diagnostic Monitor Accuracy

The following characteristics are defined over recommended operating conditions

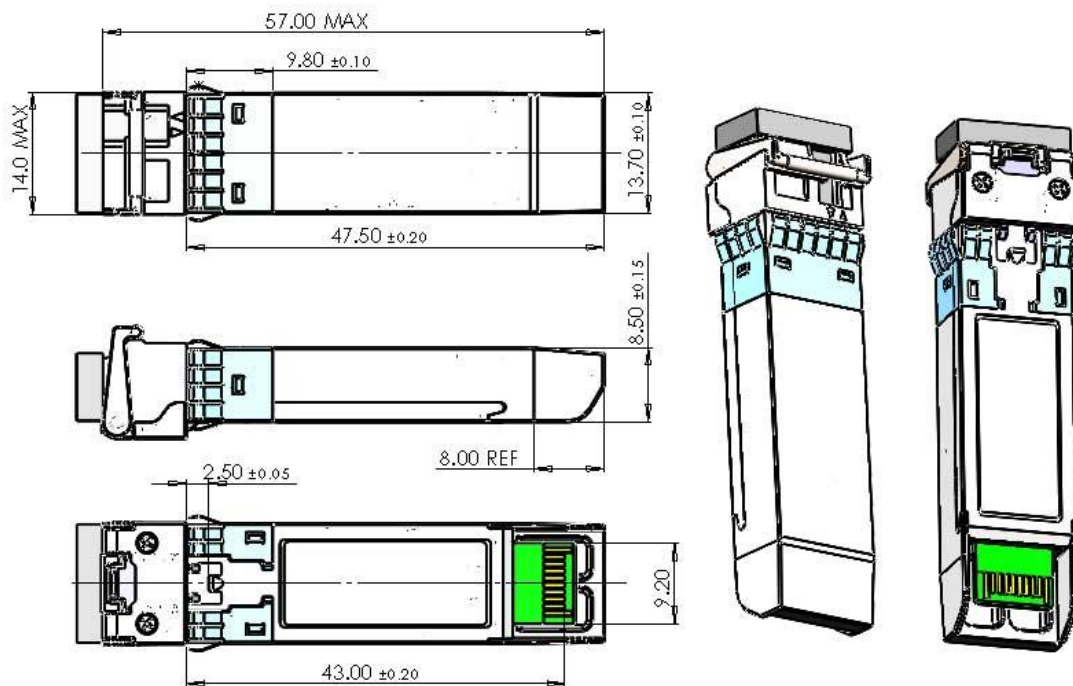
Parameter	Accuracy	Unit
Internally measured transceiver temperature	+/-3	deg.C
Internally measured transceiver supply voltage	+/-3	%
Measured Tx bias current	+/-10	%
Measured Tx output power	+/-3	dB
Measured Rx received average optical power	+/-3	dB

## Recommended Interface Circuit





## Outline 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