



## **25G-SFP28-BD23(32)-20**

**25Gb/s SFP28 1270nm/1330nm 1330nm/1270nm BIDI 20km Transceiver**

### **PRODUCT FEATURES**

- Up to 25.78Gbps Data Links
- Up to 20km transmission on SMF
- 1270nm/1330nm 1330nm/1270nm DFB Laser and PIN receiver
- Metal enclosure, for lower EMI
- 2-wire interface with integrated Digital Diagnostic monitoring
- Hot-pluggable SFP28 footprint
- Specifications compliant with SFF 8472
- Compliant with SFF-8402 with LC connector
- Single 3.3V power supply
- Power dissipation < 1.2 W
- Case operating temperature:

Commercial: 0°C to +70°C

Industrial: -40°C to +85°C

### **APPLICATIONS**

- 25GBASE-LR
- eCPRI and CPRI

### **STANDARD**

- Compliant with SFF-8472 & 8431
- RoHS Compliant.

### **Ordering information**



Product part Number	Data Rate (Gbps)	Media	Wavelength (nm)	Transmission Distance(km)	Temperature Range (Tcase) (°C)	
25G-SFP28-BD23-20	25.78	Single mode fiber	1270	20	0~70	Commercial
25G-SFP28-BD23-20I	25.78	Single mode fiber	1270	20	-40~85	Industrial
25G-SFP28-BD32-20	25.78	Single mode fiber	1330	20	0~70	Commercial
25G-SFP28-BD32-20I	25.78	Single mode fiber	1330	20	-40~85	Industrial

### Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature	T <sub>s</sub>	-40	-	85	°C	
Relative Humidity	R <sub>H</sub>	5	-	95	%	
Power Supply Voltage	V <sub>CC</sub>	-0.3	-	4	V	
Signal Input Voltage	V <sub>SI</sub>	V <sub>CC</sub> -0.3	-	V <sub>CC</sub> +0.3	V	
Rx Damage Threshold	PR <sub>dmg</sub>	3			dBm	

### Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	Tcase	0	-	70	°C	25G-SFP28-BD23(32)-20
		-40	-	85	°C	25G-SFP28-BD23(32)-20I
Power Supply Voltage	V <sub>CC</sub>	3.14	3.3	3.47	V	
Power Supply Current	I <sub>CC</sub>	-		330	mA	25G-SFP28-BD23(32)-20
				360	mA	25G-SFP28-BD23(32)-20I
Data Rate	BR		25.78		Gbps	TX Rate/RX Rate
Transmission Distance	TD			20	km	
Coupled fiber	Single mode fiber					9/125um SMF

### Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Average Launched Power	P <sub>O</sub>	-3		3	dBm	
Average Launched Power(Laser Off)	P <sub>off</sub>	-	-	-30	dBm	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Center Wavelength Range	$\lambda_c$	1260	-	1280	nm	1270Tx/1330Rx
		1320		1340	nm	1330Tx/1270Rx
Spectrum Bandwidth(-20dB)	$\Delta\lambda$	-	-	1	nm	
Side-Mode Suppression Ratio	SMSR	30	-	-	dB	
Transmitter and Dispersion Penalty	TDP			2.7	dB	
Extinction Ratio	ER	3.5		-	dB	Note (1)
Output Eye Mask	{0.31,0.4,0.45,0.34,0.38,0.4}					
<b>Receiver</b>						
Center Wavelength Range	$\lambda_c$	1320		1340	nm	1270Tx/1330Rx
		1260	-	1280	nm	1330Rx/1270Tx
Damage threshold		3			dBm	
Receiver Power	$P_{SAT}$	-13.3	-	2	dBm	Note (2)
Receiver Sensitivity (OMA)	$P_{sen1}$	-	-	-11.3	dBm	Note (2)
Los Of Signal Assert	$P_A$	-30	-	-	dBm	
Los Of Signal De-assert	$P_D$	-	-	-15	dBm	
LOS -Hysteresis	$P_{Hys}$	0.5	2	6	dB	

Note:

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

Note (2): Measured with Light source 1310nm; BER  $\leq 5 \times 10^{-5}$  @PRBS= $2^{31}-1$  NRZ.

## Electrical Interface Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Input differential impedance	R <sub>in</sub>		100		Ω	1
Single ended data input swing	V <sub>in,pp</sub>	180		700	mV	
Transmitter Fault Output-High	V <sub>FaultH</sub>	2	-	V <sub>cc</sub> +0.3	V	
Transmitter Fault Output-Low	V <sub>FaultL</sub>	0	-	0.8	V	
Transmitter Disable Voltage- High	V <sub>DisH</sub>	2	-	V <sub>cc</sub> +0.3	V	
Transmitter Disable Voltage- low	V <sub>DisL</sub>	0	-	0.8	V	
<b>Receiver</b>						
Differential data output swing	V <sub>out,pp</sub>	300		850	mV	2
LOS Output Voltage-High	V <sub>LOSH</sub>	2	-	V <sub>cc</sub> +0.3	V	
LOS Output Voltage-Low	V <sub>LOSL</sub>	0	-	0.8	V	

### Notes:

1. Connected directly to TX data input pins. AC coupled thereafter.
2. Into 100 ohms differential termination.

## Pin Description

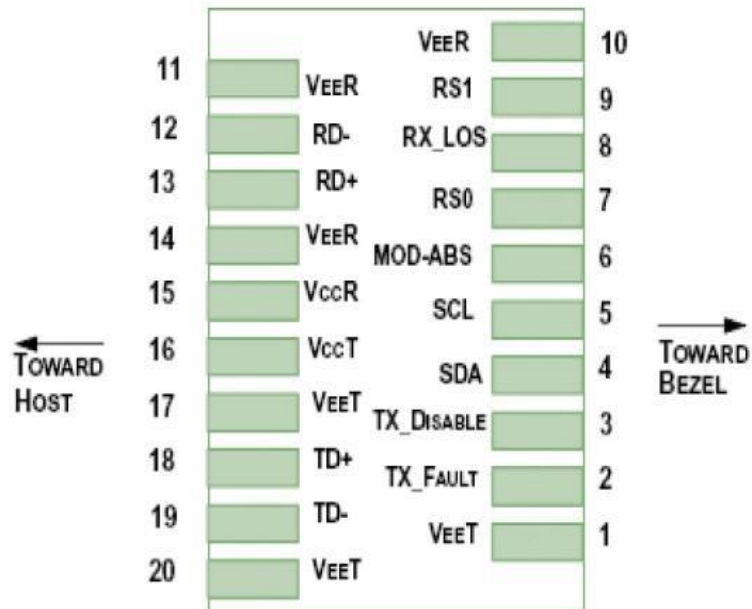


Diagram of Host Board Connector Block Pin Numbers and Name

Pin	Symbol	Name/Description	NOTE
1	V <sub>EET</sub>	Transmitter Ground (Common with Receiver Ground)	1

Pin	Symbol	Name/Description	NOTE
2	T <sub>FAULT</sub>	Transmitter Fault.	2
3	T <sub>DIS</sub>	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 (Rx): Low=CDR Bypass; High=CDR Select	5
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	6
9	RS1	Rate select 1 (Tx): Low=CDR Bypass; High=CDR Select	5
10	V <sub>EER</sub>	Receiver Ground (Common with Transmitter Ground)	1
11	V <sub>EER</sub>	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 <sub>EER</sub>	Receiver Ground (Common with Transmitter Ground)	1
15	V <sub>CCR</sub>	Receiver Power Supply	
16	V <sub>CCT</sub>	Transmitter Power Supply	
17	V <sub>EET</sub>	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 <sub>EET</sub>	Transmitter Ground (Common with Receiver Ground)	1

#### Notes:

1. Circuit ground is internally isolated from chassis ground.
2. T<sub>FAULT</sub> 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<sub>cc</sub> + 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<sub>DIS</sub>>2.0V or open, enabled on T<sub>DIS</sub><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.

## CDR Functionality

Through I2C interface address 0xA2H, the data rate ranges can be set through bytes 110,118. The default configuration sets both CDR lock at 25Gb/s, unless the soft bits are set as shown in below logic table.

RS0	Hard: Pin #7	Soft: A2H, Byte 110.3	CDR	Note
	0	0	RxCDR Bypass Mode	
	0	1	RxCDR Locking Mode	Default
	1	0	RxCDR Locking Mode	
	1	1	RxCDR Locking Mode	
RS1	Hard: Pin #9	Soft: A2H, Byte 118.3	CDR	
	0	0	TxCDR Bypass Mode	
	0	1	TxCDR Locking Mode	Default
	1	0	TxCDR Locking Mode	
	1	1	TxCDR Locking Mode	

## Tx input equalization and Rx output emphasis Functionality

Through the I2C interface, the data address 0xA2H, the equalization and emphasis can be set through bytes 114,115.

### INPUT EQUALIZATION (ADDRESS A2H BYTE 114.7~114.4)

Code	Transmitter Input Equalization		
	Nominal	Units	Note
11xx	Reserved		
1011	Reserved		
1010	10	dB	
1001	9	dB	
1000	8	dB	
0111	7	dB	
0110	6	dB	
0101	5	dB	
0100	4	dB	
0011	3	dB	
0010	2	dB	
0001	1	dB	
0000	0	No EQ	

### OUTPUT EMPHASIS CONTROL (ADDRESS A2H BYTE 115.7~115.4)

Code	Receiver Output Emphasis At Nominal Output Amplitude		
	Nominal	Units	Note
1xxx	Vendor Specific		
0111	7	dB	
0110	6	dB	
0101	5	dB	
0100	4	dB	
0011	3	dB	
0010	2	dB	

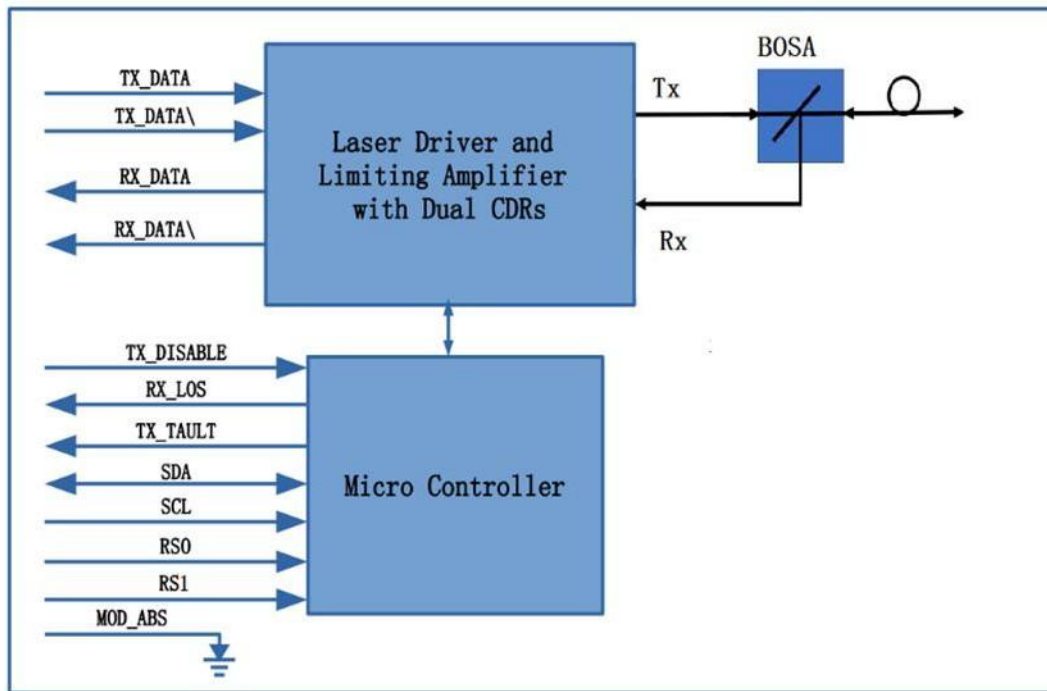
0001	1	dB	
0000	0	No Emphasis	

## Digital Diagnostic Monitor Accuracy

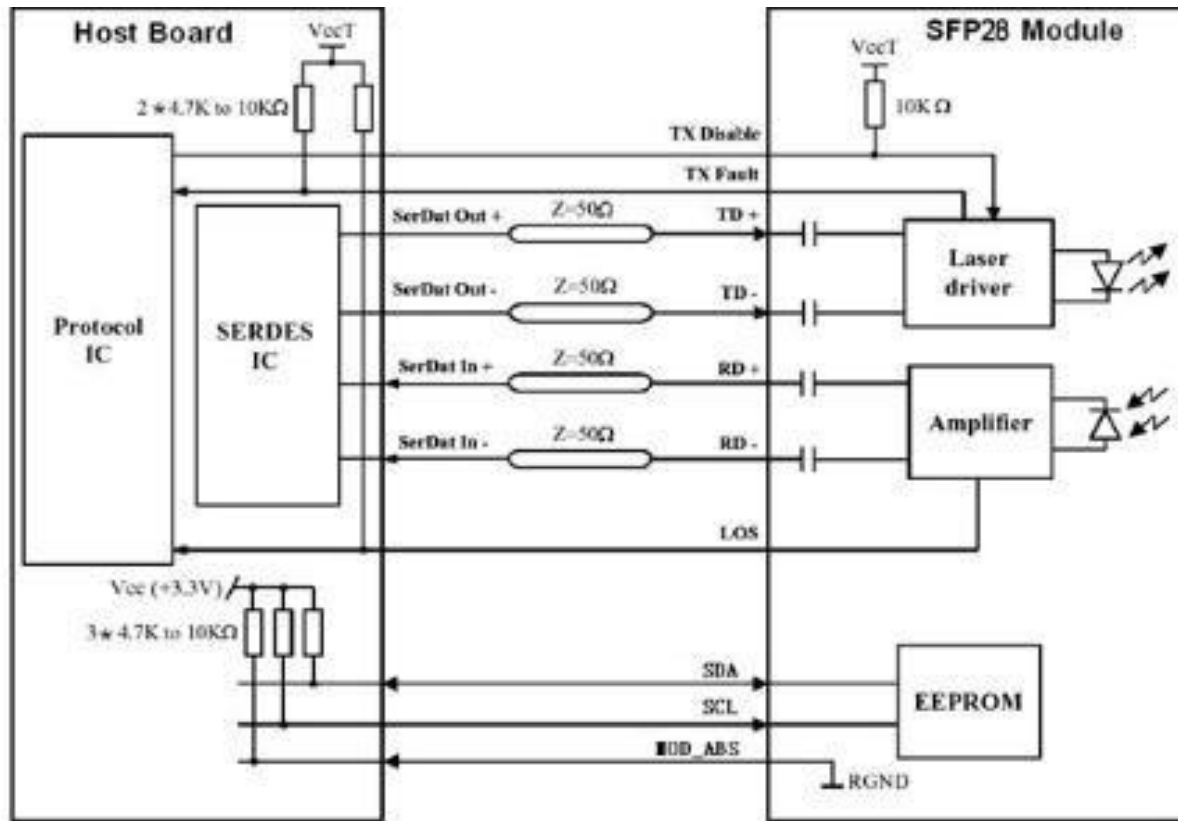
The following characteristics are defined over recommended operating conditions

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

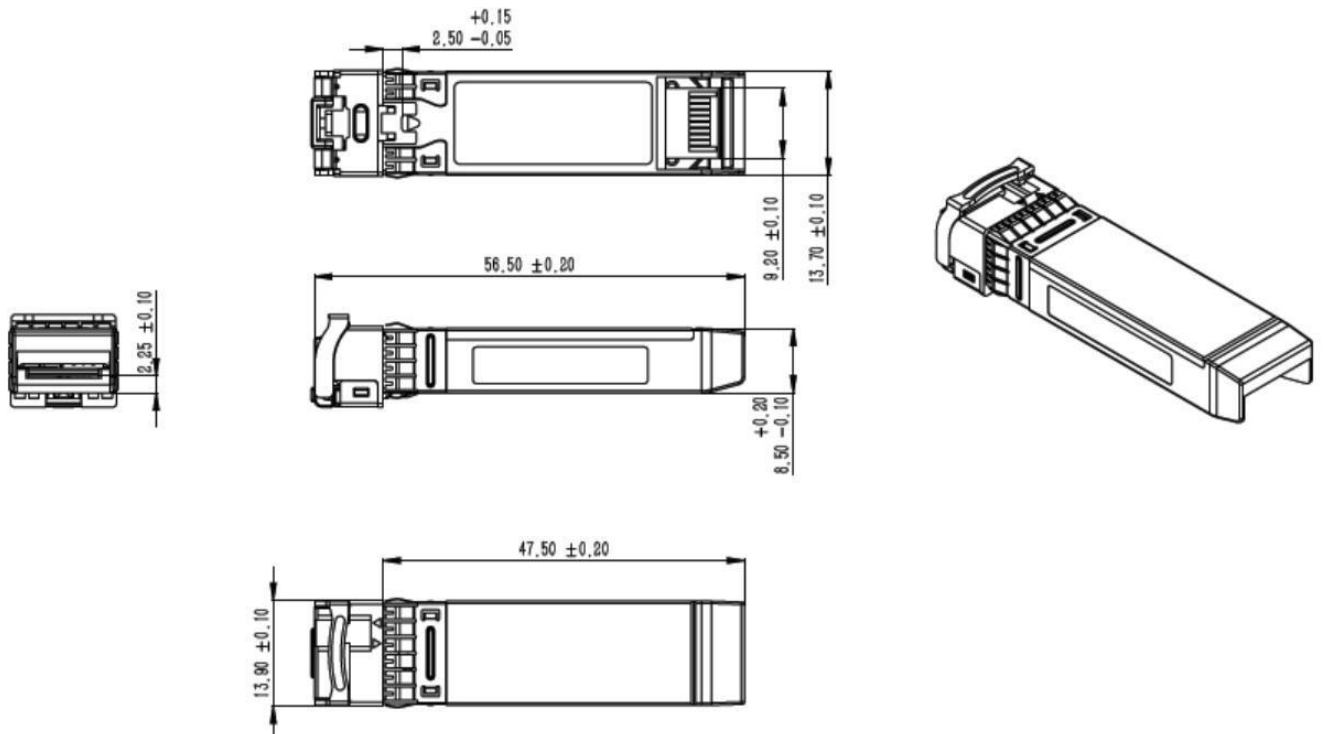
## Block Diagram of Transceiver



## Recommended Interface Circuit



## Outline Dimensions







## Document Revision

Version No.	Date	Description
1.00	2018-04-16	Initial release
1.1	2019-04-16	Update Average Launched Power
1.20	2020-05-25	Update Outline Dimensions