

### 10Gbps Single-Mode BIDI 1270/1330nm 10km SFP+ Optical Transceiver--BLSFP-10G23-10-xx 10Gbps Single-Mode BIDI 1330/1270nm 10km SFP+ Optical Transceiver--BLSFP-10G32-10-xx



#### Features

- Operating data rate up to 10.3Gbps
- Two types:
  - A: 1270nm DFB Transmitter/ 1330nm Receiver
  - B: 1330nm DFB Transmitter/ 1270nm Receiver
- Power budget 9dB at least
- Single 3.3V Power supply and TTL Logic Interface
- LC Connector Interface
- Hot Pluggable
- Power Dissipation < 1.5W
- Operating case temperature
  - Standard : 0°C to +70°C
- Compliant with SFP+ MSA Specification SFF-8431
- Compliant with IEEE 802.3ae 10GBASE-LR
- Compliant with IEEE 802.3ae 10GBASE-LW

#### Applications

- 10GBASE-LR at 10.3125Gbps
- 10GBASE-LW at 9.953Gbps
- Other Optical Links

#### Description

The 10G SFP+ BIDI series single mode transceiver is small form factor pluggable module for duplex optical data communications such as 10GBASE-LR/LW defined by IEEE 802.3ae. It is with the SFP+ 20-pin connector to allow hot plug capability.

The BLSFP-10G23-10-xx module is designed for single mode fiber and operates at a nominal wavelength of 1270nm; BLSFP-10G32-10-xx module is designed for single mode fiber and operates at a nominal wavelength of 1330nm. The transmitter section uses a multiple quantum well DFB, which is class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

#### Specifications

**Table 1 - Absolute Maximum Ratings**

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.5	3.6	V
Storage Temperature	Ts	-40	+85	°C

Operating Humidity	-	-	95	%
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**Table 2 - Recommended Operating Conditions**

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	T <sub>c</sub>	0		+70	°C
Power Supply Voltage	V <sub>cc</sub>	3.15	3.3	3.45	V
Surge Current	I <sub>surge</sub>			+30	mA
Power Supply Current	I <sub>cc</sub>			430	mA
Baud Rate			9.953/10.3125		GBaud

**Table 3 - Performance Specifications - Electrical**

Parameter	Symbol	Min	Typical	Max	Unit	Notes
<b>Transmitter</b>						
CML Inputs(Differential)	V <sub>in</sub>	150		1200	mVpp	AC coupled inputs
Input Impedance (Differential)	Z <sub>in</sub>	85	100	115	ohms	R <sub>in</sub> > 100 kohms@ DC
Tx_DISABLE Input Voltage - High		2		V <sub>cc</sub> +0.3	V	
Tx_DISABLE Input Voltage - Low		0		0.8	V	
Tx_FAULT Output Voltage - High		2		V <sub>cc</sub> +0.3	V	I <sub>o</sub> = 400 μ A; Host V <sub>cc</sub>
Tx_FAULT Output Voltage - Low		0		0.5	V	I <sub>o</sub> = -4.0mA
<b>Receiver</b>						
CML Outputs (Differential)	V <sub>out</sub>	350		700	mVpp	AC coupled outputs
Output Impedance (Differential)	Z <sub>out</sub>	85	100	115	ohms	
Rx_LOS Output Voltage - High		2		V <sub>cc</sub> +0.3	V	I <sub>o</sub> = 400 μ A; Host V <sub>cc</sub>
Rx_LOS Output Voltage - Low		0		0.8	V	I <sub>o</sub> = -4.0mA
MOD_DEF ( 2:0 )	VoH	2.5			V	With Serial ID
	VoL	0		0.5	V	

**Table4-Optical and Electrical Characteristics**  
**(BLSFP-10G23-10-xx, 1270nm DFB & PIN/TIA)**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Power Budget		9			dB	
Date Rate			9.953/10.3125		Gbps	
<b>Transmitter</b>						
Centre Wavelength	$\lambda_C$	1260	1270	1280	nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Average Output Power	$P_{out,AVG}$	-5		0	dBm	1
Extinction Ratio	ER	3.5			dB	
Side Mode Suppression Ratio	SMSR	30			dB	
Transmitter and Dispersion Penalty	TDP			2	dB	
Average Power of OFF Transmitter				-30	dBm	
Relative Intensity Noise	RIN			-128	dB/Hz	
Input Differential Impedance	$Z_{IN}$	90	100	110	$\Omega$	
TX Disable Assert Time	$t_{off}$			10	us	
<b>Receiver</b>						
Centre Wavelength	$\lambda_C$	1320		1340	nm	
Sensitivity	$P_{IN}$			-14	dBm	2
Receiver Overload	$P_{MAX}$	0.5			dBm	
Output Differential Impedance	$P_{IN}$	90	100	110	$\Omega$	
LOS De-Assert	$LOS_D$			-18	dBm	
LOS Assert	$LOS_A$	-30			dBm	
LOS	High	2		$V_{CC}+0.3$	V	
	Low	0		0.8		

**(BLSFP-10G32-10-xx, 1330nm DFB & PIN/TIA)**

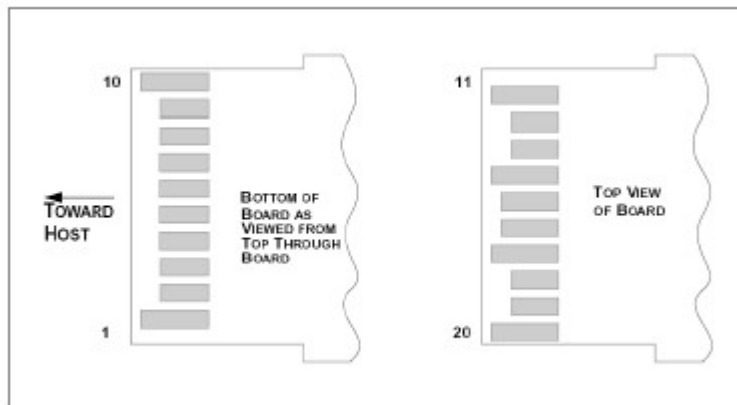
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Power Budget		9			dB	
Date Rate			9.953/10.3125		Gbps	
<b>Transmitter</b>						
Centre Wavelength	$\lambda_C$	1320	1330	1340	nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Average Output Power	$P_{out,AVG}$	-5		0	dBm	1
Extinction Ratio	ER	3.5			dB	
Side Mode Suppression Ratio	SMSR	30			dB	
Transmitter and Dispersion Penalty	TDP			2	dB	
Average Power of OFF Transmitter				-30	dBm	
Relative Intensity Noise	RIN			-128	dB/Hz	
Input Differential Impedance	$Z_{IN}$	90	100	110	$\Omega$	

TX Disable	Disable		2		$V_{CC}+0.3$	V	
	Enable		0		0.8		
TX Fault	Fault		2		$V_{CC}+0.3$	V	
	Normal		0		0.8		
TX Disable Assert Time		$t_{off}$			10	us	
Receiver							
Centre Wavelength		$\lambda_C$	1260		1280	nm	
Sensitivity		$P_{IN}$			-14	dBm	2
Receiver Overload		$P_{MAX}$	0.5			dBm	
Output Differential Impedance		$P_{IN}$	90	100	110	$\Omega$	
LOS De-Assert		$LOS_D$			-18	dBm	
LOS Assert		$LOS_A$	-30			dBm	
LOS	High		2		$V_{CC}+0.3$	V	
	Low		0		0.8		

### Notes:

1. Output is coupled into a 9/125 $\mu$ m single-mode fiber.
2. Minimum average optical power measured at the BER less than 1E-12. The measure pattern is PRBS 2<sup>31</sup>-1.

### SFP+ Transceiver Electrical Pad Layout



**Table 5– Diagnostics Specification**

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	0 to +5	dBm	±3dB	Internal / External

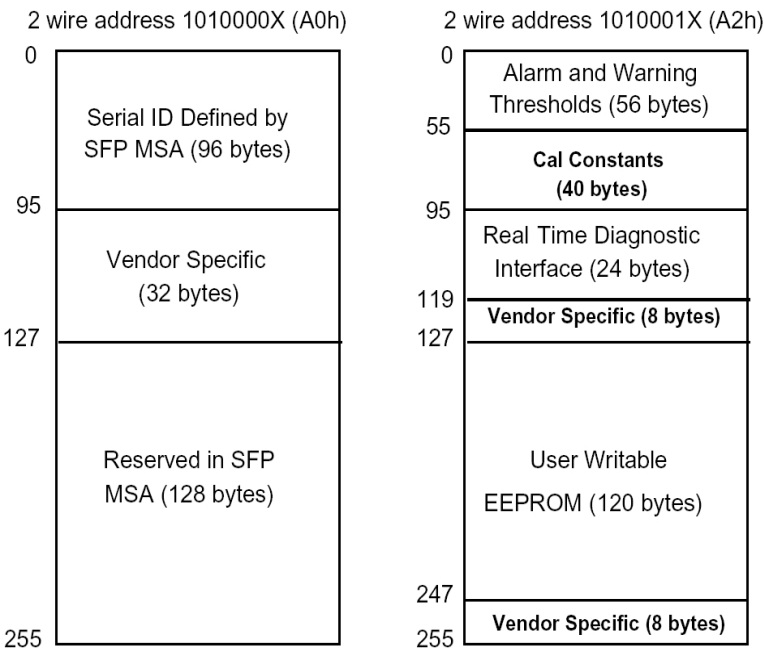
RX Power	-23 to -3	dBm	±3dB	Internal / External
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Digital Diagnostic Memory Map

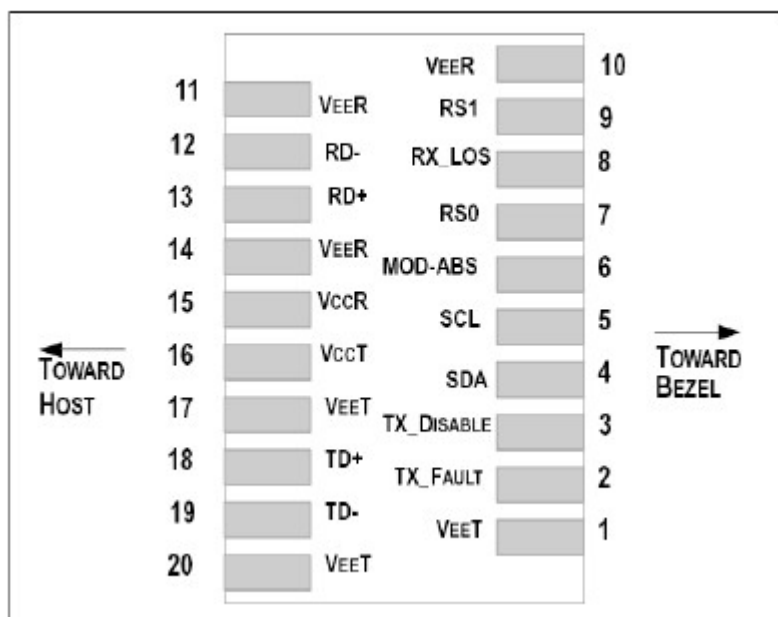
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

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 Function Definition



Pin	Signal Name	Description	Plug Seq.	Notes
1	Veet	Transmitter Ground	1	Note5
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2, Module disables on high or open
4	MOD_DEF(2)	Serial Data Signal	3	Note 3, Data line for Serial ID.
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3, Clock line for Serial ID.
6	MOD_DEF(0)	TTL Low	3	Note 3
7	RS0	RX Rate Select (LVTTTL).	3	Rate Select 0, optionally controls SFP+ module receiver. This pin is pulled low to VeeT with a >30K resistor
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select(LVTTTL).	1	Rate Select 1, optionally controls SFP+ module transmitter. This pin is pulled low to VeeT with a >30K resistor
10	VeeR	Receiver ground	1	Note 5
11	VeeR	Receiver ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 7
14	VeeR	Receiver ground	1	Note 5
15	VccR	Receiver Power Supply	2	3.3 ± 5%, Note 7
16	VccT	Transmitter Power Supply	2	3.3 ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8

20	VeeT	Transmitter Ground	1	Note 5
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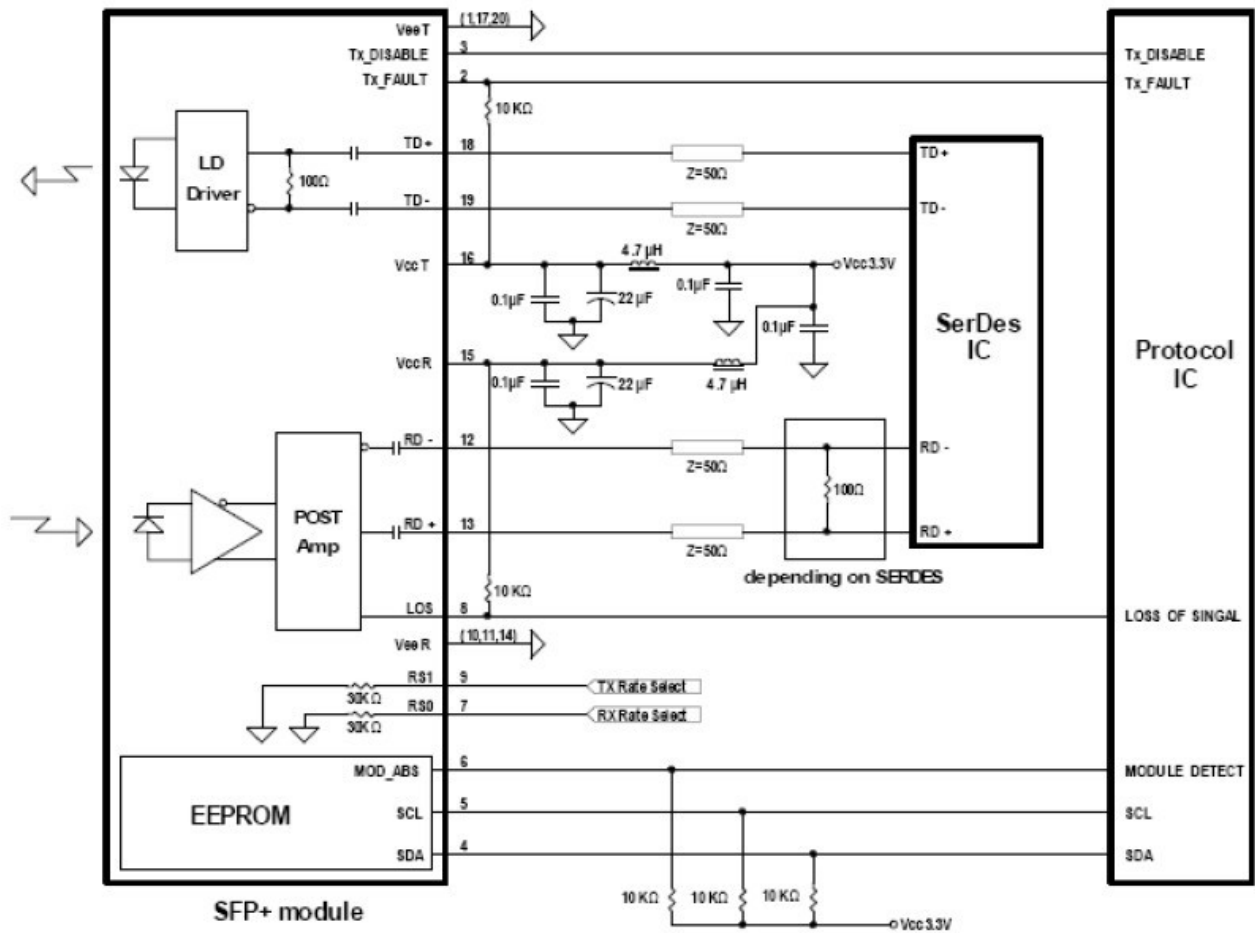
### Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

- 1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10kΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 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:
 

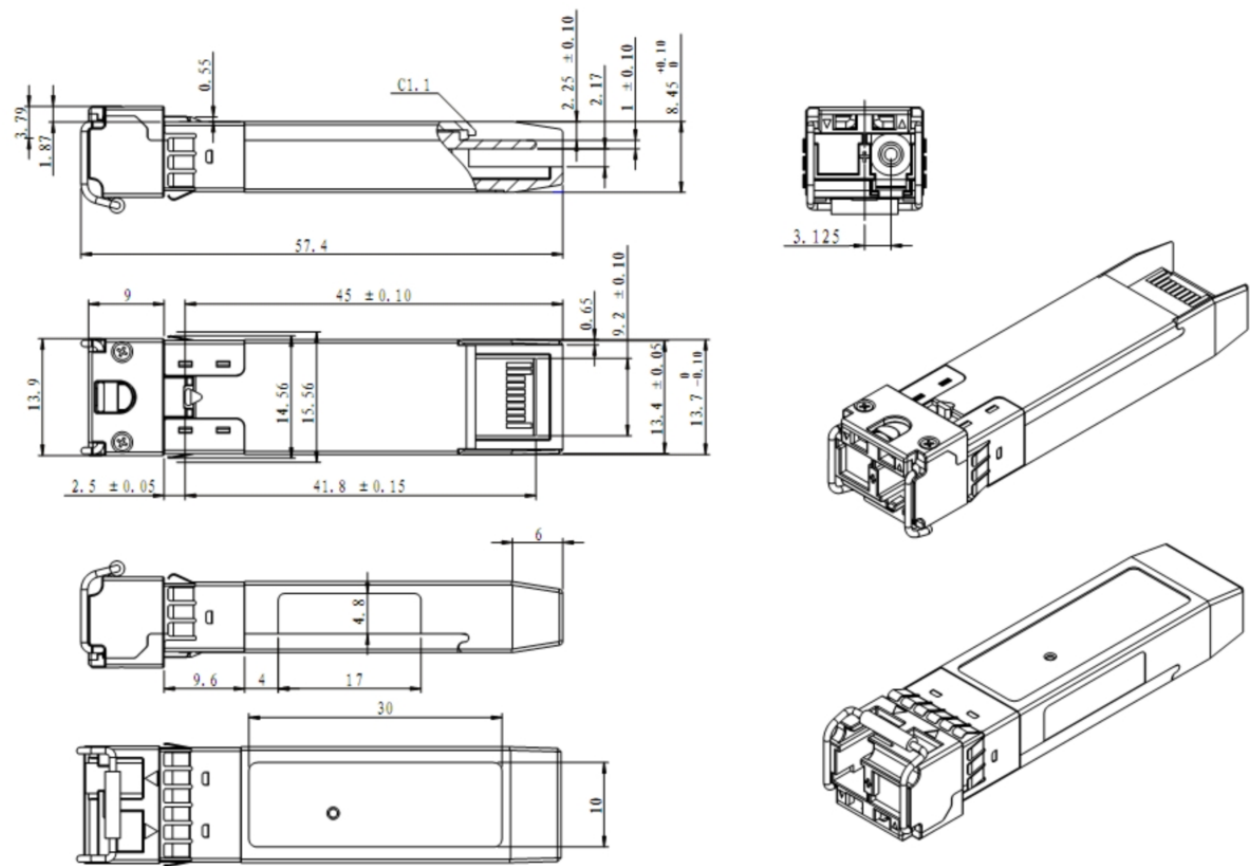
Low (0 to 0.8V):	Transmitter on
(>0.8V, < 2.0V):	Undefined
High (2.0 to 3.465V):	Transmitter Disabled
Open:	Transmitter Disabled
- 3) Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.  
 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 (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10kΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to <0.8V.
- 5) VeeR and VeeT may be internally connected within the SFP+ module.
- 6) 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.
- 7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP+ connector pin. Maximum supply current is 300mA. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP+ transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP+ transceiver module.
- 8) 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.

### Recommend Circuit Schematic





Mechanical Dimensions



### Ordering Information

Part No.	Data Rate (Gbps)	Wavelength (nm)	Connector Type	Transmission Distance (km)	Operating case temperature (° C)	Digital Diagnostics
<b>BLSFP-10G23-10-xx</b>	10	TX1270nm/RX1330nm	LC	10	0 to +70	Yes
<b>BLSFP-10G32-10-xx</b>	10	TX1330nm/RX1270nm	LC	10	0 to +70	Yes

#### Notes:

xx means compatible brand. (For example: CO= Cisco, JU=Juniper, FD=Foundry, EX=Extreme, NE=Netgear,etc.)

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