

# 10GBASE-BX SFP+

# 1490nmTX/1550nmRX 100km

# DOM Transceiver

SFP-10G-BX100



## Application

- 10.3125Gbps Ethernet
- Other optical link

## Features

- Supports 9.95 to 11.3Gb/s bit rates
- Simplex LC Connector
- Hot pluggable SFP+ footprint
- Cooled 1490nm EML transmitter, 1550nm APD receiver
- Cooled 1550nm EML transmitter, 1490nm APD receiver
- Applicable for 100km SMF connection
- Low power consumption, < 1.5W
- Digital Diagnostic Monitor Interface
- Optical interface compliant to IEEE 802.3ae 10GBASE-ZR
- Electrical interface compliant to SFF-8431
- Operating case temperature : Commerical:0 to 70 °C

## Description

SFP-10G-BX100 series single mode transceiver is small form factor pluggable module for optical data communications such as 10G Ethernet. It is with the SFP+ 20-pin connector to allow hot plug capability. The SFP-10G-BX100 module is designed for single mode fiber and operates at a nominal wavelength of 1490nm or 1550nm; The transmitter section uses a EML laser, which is class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section consists of a APD photodiode integrated with a TIA. The transceiver designs are optimized for high performance and cost effective to supply customers the best solutions for telecommunication.

## Product Specifications

### I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Ref.
<b>Supply Voltage</b>	V <sub>CC</sub>	-0.5	4.0	V	
<b>Storage Temperature</b>	T <sub>S</sub>	-40	85	°C	
<b>Relative Humidity</b>	RH	0	85	%	

**Note:** Stress in excess of the maximum absolute ratings can cause permanent damage to the transceiver.

### II. General Operating Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref.
<b>Data Rate</b>	D <sub>R</sub>	9.95	10.3125	11.3	Gb/s	
<b>Supply Voltage</b>	V <sub>CC</sub>	3.13	3.3	3.47	V	
<b>Supply Current</b>	I <sub>CC5</sub>			450	mA	
<b>Operating Case Temp.</b>	T <sub>C</sub>	0		70	°C	

### III. Electrical Characteristics ( $TOP_{(C)} = 0$ to $70$ °C, $V_{CC} = 3.13$ to $3.47$ V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref.
<b>Transmitter</b>						
<b>Differential data input swing</b>	$V_{IN,PP}$	120		850	mVpp	1
<b>Transmit Disable Voltage</b>	$V_D$	$V_{CC}-0.8$		$V_{CC}$	V	
<b>Transmit Enable Voltage</b>	$V_{EN}$	Vee		$V_{ee}+0.8$		
<b>Input differential impedance</b>	$R_{in}$		100		$\Omega$	
<b>Receiver</b>						
<b>Differential data output swing</b>	$V_{out,pp}$	300		850	mV <sub>pp</sub>	2
<b>Output rise time and fall time</b>	$T_r, T_f$	28			Ps	3
<b>LOS asserted</b>	$V_{LOS\_F}$	$V_{CC}-0.8$		$V_{CC}$	V	4
<b>LOS de-asserted</b>	$V_{LOS\_N}$	Vee		$V_{ee}+0.8$	V	4

#### Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Into 100 $\Omega$  differential termination.
3. 20 – 80%. Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's sequence in the PRBS 9 is an acceptable alternative.
4. LOS is an open collector output. Should be pulled up with 4.7k $\Omega$  – 10k $\Omega$  on the host board. Normal operation is logic 0; loss of signal is logic 1.

### IV. Optical Characteristics ( $TOP_{(C)} = 0$ to $70$ °C, $TOP_{(I)} = -40$ to $80$ °C, $V_{CC} = 3.13$ to $3.47$ V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref.
<b>Transmitter</b>						
<b>Operating Wavelength</b>	$\lambda$	1470	1490	1510	nm	
		1530	1550	1565		
<b>Ave. output power (Enabled)</b>	$P_{AVE}$	1		5	dBm	1

<b>Side-Mode Suppression Ratio</b>	SMSR	30				dB	
<b>Extinction Ratio</b>	ER	9				dB	
<b>RMS spectral width</b>	$\Delta\lambda$				1	nm	
<b>Rise/Fall time (20%~80%)</b>	$T_r/T_f$				50	ps	
<b>Dispersion penalty</b>	$T_{DP}$				3.2	dB	
<b>Relative Intensity Noise</b>	$R_{IN}$				-128	dB/Hz	
<b>Output Optical Eye</b>	Compliant with IEEE 802.3ae						

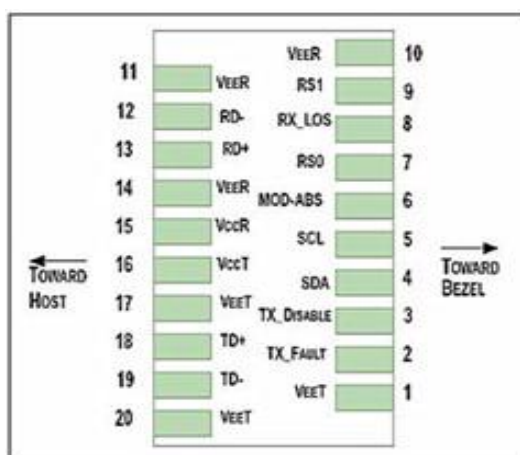
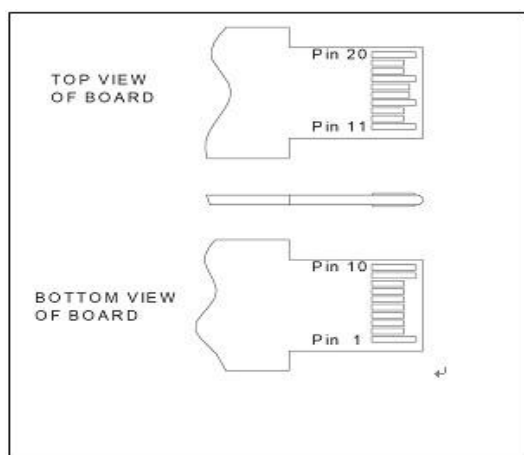
### Receiver

<b>Operating Wavelength</b>	$\lambda$	1530	1550	1565	nm		
		1470	1490	1510			
<b>Receiver Sensitivity</b>	$P_{SEN1}$				-22	dBm	2
<b>Sensitivity over 80Km fiber</b>	$P_{SEN2}$				-20	dBm	2
<b>Overload</b>	$P_{AVE}$				-7	dBm	
<b>LOS Assert</b>	$P_a$	-35				dBm	
<b>LOS De-assert</b>	$P_d$				-24	dBm	
<b>LOS Hysteresis</b>	$P_d-P_a$	0.5				dB	

#### Notes:

1. Average power figures are informative only, per IEEE 802.3ae.
2. Measured with worst ER=9; BER<10<sup>-12</sup>; 231 – 1 PRBS.

## V. Pin Defintion And Functions



Pin	Symbol	Name/Description
1	VEET [1]	Transmitter Ground
2	Tx_FAULT [2]	Transmitter Fault
3	Tx_DIS [3]	Transmitter Disable. Laser output disabled on high or open
4	SDA [2]	2-wire Serial Interface Data Line
5	SCL [2]	2-wire Serial Interface Clock Line
6	MOD_ABS [4]	Module Absent. Grounded within the module
7	RS0	Rate Select 0
8	RX_LOS [2]	Loss of Signal indication. Logic 0 indicates normal operation
9	RS1 [5]	Rate Select 1
10	VEER [1]	Receiver Ground
11	VEER [1]	Receiver Ground
12	RD-	Receiver Inverted DATA out. AC Coupled
13	RD+	Receiver DATA out. AC Coupled
14	VEER [1]	Receiver Ground
15	VCCR	Receiver Power Supply
16	VCCT	Transmitter Power Supply
17	VEET [1]	Transmitter Ground

18	TD+	Transmitter DATA in. AC Coupled
19	TD-	Transmitter Inverted DATA in. AC Coupled
20	VEET [1]	Transmitter Ground

**Notes:**

- 1.Module circuit ground is isolated from module chassis ground within the module.
- 2.should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15V and 3.6V.
- 3.Tx\_Disable is an input contact with a 4.7 kΩ to 10 kΩ pullup to VccT inside the module.
- 4.Mod\_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to Vcc\_Host with a resistor in the range 4.7 kΩ to 10 kΩ. Mod\_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.

## VI. Serial Interface for ID and DDM

The SFP-10G-BX100 transceiver support the 2-wire serial communication protocol as defined in the SFP+ MSA. The standard SFP+ serial ID provides access to identification information that describes the transceiver’s capabilities, standard interfaces, manufacturer, and other information. Additionally, This SFP+ transceivers provide an enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The SFP MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X(A0h), so the originally monitoring interface makes use of the 8 bit address(A2h), so the originally defined serial ID memory map remains unchanged. The structure of the memory map is shown in Table1.

2 wire address 1010000X (A0h)		2 wire address 1010001X (A2h)	
Address	Information	Address	Information
0~95	Serial ID Defined by SFP MSA (96 bytes)	0~55	Alarm and Warning Thresholds (56 bytes)
		56~95	Calibration Constants (40 bytes)
96~127	Vendor Specific (32 bytes)	96~119	Real Time Diagnostic Interface (24 bytes)
		120~127	Vender Specific (8 bytes)
128~255	Reserved,SFF8079 (128 bytes)	128~247	User Writable EEPROM (120 bytes)
		248~255	Vender Specific (8 bytes)

**Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)**

## VII. Digital Diagnostic Specifications

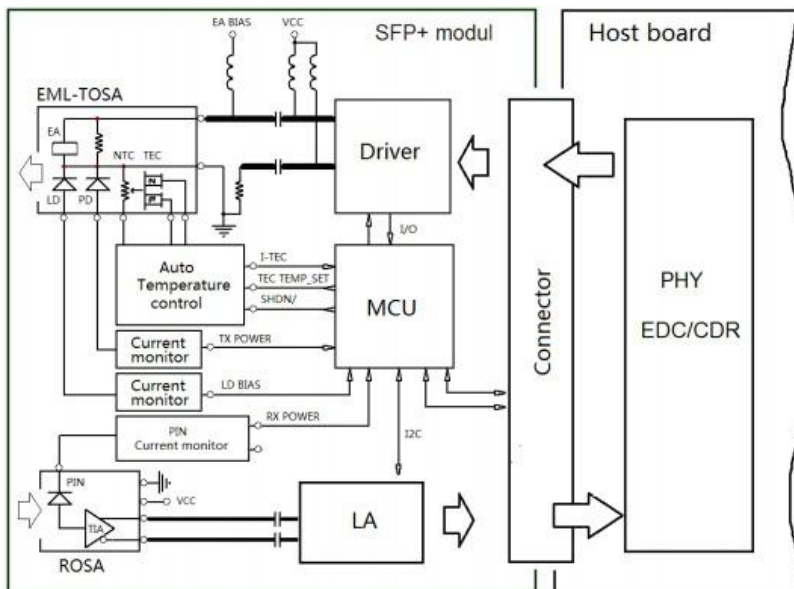
The SFP-10G-BX100 transceivers can be used in host systems that require either internally or externally calibrated digital diagnostics.

Parameter	Symbol	Units	Min.	Max.	Accuracy	Note
<b>Transceiver temperature</b>	$D_{Temp-E}$	°C	-5	+75	±5°C	1
<b>Transceiver supply voltage</b>	$D_{Voltage}$	V	2.8	4.0	±3%	
<b>Transmitter bias current</b>	$D_{Bias}$	mA	0	127	±10%	2
<b>Transmitter output power</b>	$D_{Tx-Power}$	dBm	-1	+6	±2dB	
<b>Receiver average input power</b>	$D_{Rx-Power}$	dBm	-30	-6	±2dB	

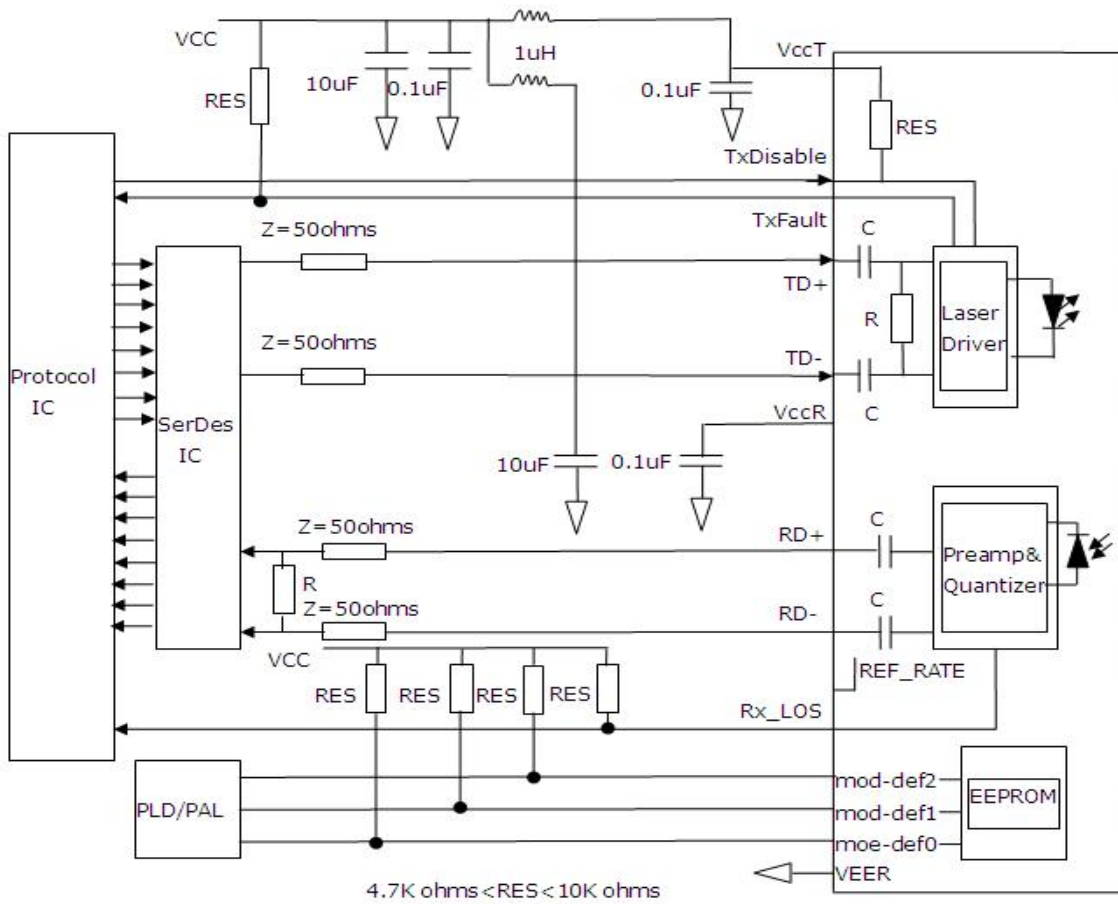
**Notes:**

1. Internally measured
2. The accuracy of the Tx bias current is 10% of the actual current from the laser driver to the laser

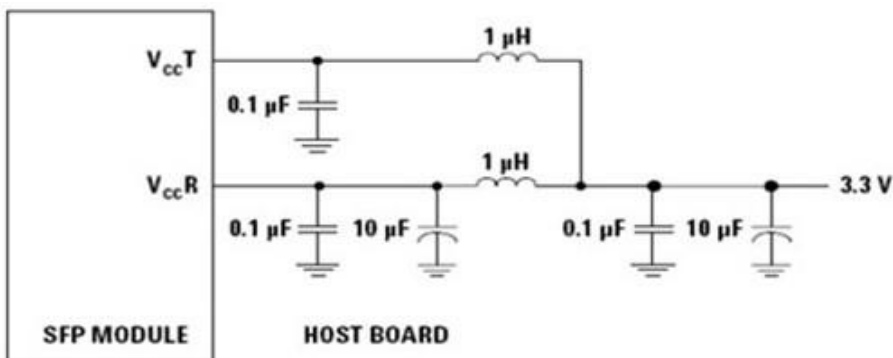
## VIII. Functional Diagram



## IX. Typical Interface Circuit



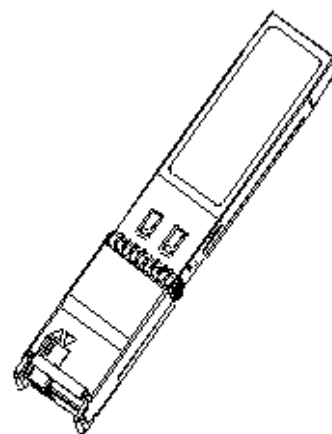
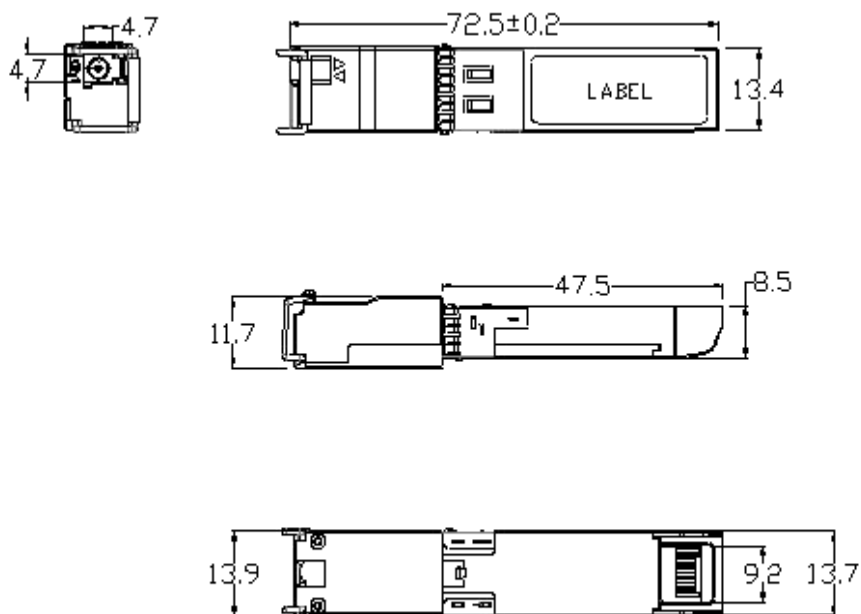
## X. Recommended power supply filter



**Note:** Inductors with DC resistance of less than 1Ω 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 30 mA greater than the steady state value.



## XI. Package Dimensions



Units in mm

Tolerance without indication is  $\pm 0.1$ mm

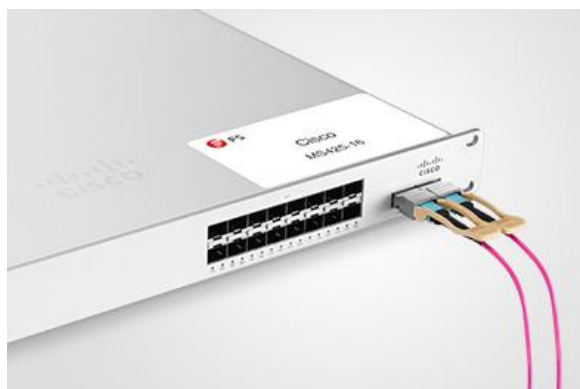
## Test Center

### I. Compatibility Testing

Each fiber optical transceiver has been tested in host device on site in FS Assured Program to ensure full compatibility with over 200 vendors.



Cisco Catalyst C9500-24Y4C



Cisco MS425-16



Brocade VDX 6940-144S



Dell EMC Networking Z9100-ON



Force<sup>10</sup> S60-44T

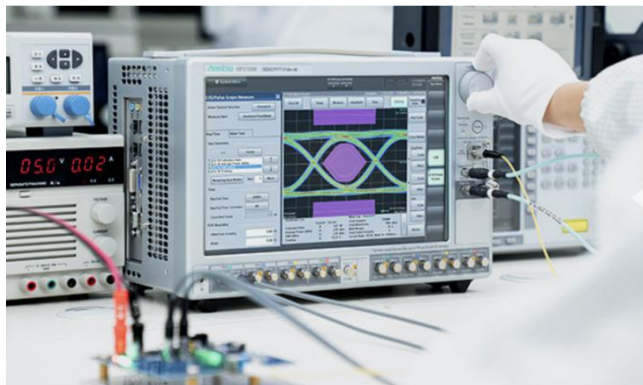


HUAWEI S6720-30L-HI-24S

Above is part of our test bed network equipment. For more information, please click the [Test Bed PDF](#). It will be updated in real time as we expand our portfolio.

## II. Performance Testing

Each fiber optical transceiver has been fully tested in FS Assured Program equipped with world's most advanced analytical equipment to ensure that our transceivers work perfectly on your device.



### 1. TX/RX Single Quality Testing

Equipped with the all-in-one tester integrated 4ch BERT & sampling oscilloscope, and variable optical attenuator the input and output signal quality.

- Eye Pattern Measurements: Jitter, Mask Margin, etc
- Average Output Power
- OMA
- Extinction Ratio
- Receiver Sensitivity
- BER Curve

### 2. Reliability and Stability Testing

Subject the transceivers to dramatic in temperature on the thermal shock chamber to ensure reliability and stability of the transceivers.

- Commercial: 0°C to 70°C
- Extended: -5°C to 85°C
- Industrial: -40°C to 85°C



### 3. Transfer Rate and Protocol Testing

Test the actual transfer data rate and the transmission ability under different protocols with Networks Master Pro.

- Ethernet
- Fiber Channel
- SDH/SONET
- CPRI

### 4. Optical Spectrum Evaluation

Evaluate various important parameters with the Optical Spectrum Analyzer to meet the industry standards.

- Center Wavelength, Level
- OSNR
- SMSR
- Spectrum Width



## Ordering Information

Part Number	Description
SFP-10G-BX100	SFP+Bidi,3Gb/s, 1490/1550nm,100km, 0~70°C, with DDM
SFP-10G-BX100	SFP+Bidi,9.95 to 10.3Gb/s, 1550/1490nm, 100km, 0~70°C, with DDM

**Notes:** When CWDM wavelengths, the wavelength spacing>20nm



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