OPB10G-xx10DxR

10GBASE-BX SFP+ BiDi Transceiver, 1270nm-TX/1330nm-RX or 1330nm-TX/1270nm-RX, 10km

Features

- Supports 9.95 to 11.3Gb/s bit rates
- Simplex LC Connector
- Hot pluggable SFP+ footprint
- OPB10G-2310DxR: Uncooled 1270nm DFB transmitter, 1330nm PIN photo-detector
- OPB10G-3210DxR: Uncooled 1330nm DFB transmitter, 1270nm PIN photo-detector
- Applicable for 10km SMF connection
- Low power consumption < 1W
- Digital Diagnostic Monitor Interface
- Optical interface compliant to IEEE 802.3ae 10GBASE-LR
- Electrical interface compliant to SFF-8431
- ROHS compliant and lead-free
- Operating Temperature: Standard 0~70ºC, Industrial -40~85ºC

Applications

- 10GBASE-LR/10GBASE-LW Ethernet
- 10G Fibre Channel
- 10G Network interface cards and Fiber Media Converters
- Other Optical Links

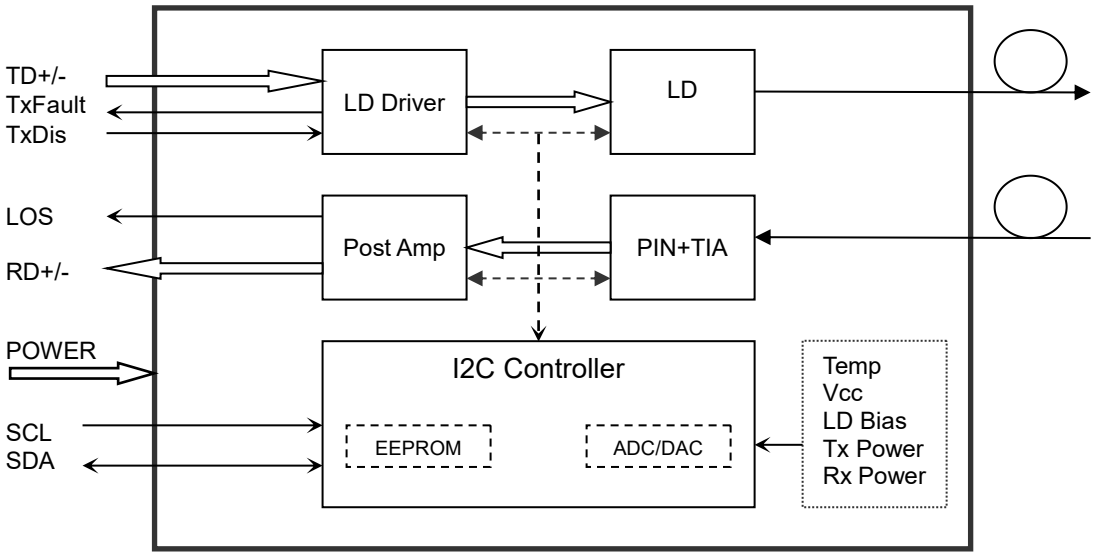
Description

Optcore's OPB10G-xx10DxR series transceiver is a small form factor pluggable Bi-Directional module for 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 SFP+ BiDi transceiver is designed for single mode fiber and operates at a nominal wavelength of 1270nm or 1330nm; The transmitter section uses a multiple quantum well DFB, a 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. The transceiver designs are optimized for high performance and cost-effectiveness to supply customers with the best telecommunication solutions.

Additionally, the 10GBASE-BX SFP+ 10km transceiver has been integrated with an enhanced digital diagnostic monitoring interface (DDMI) per SFF-8472, which provides real-time monitoring of the transceiver temperature, laser bias current, optical power, received optical power, and transceiver supply voltage. All transceivers are Class 1 laser products that comply with FDA/CDRH and IEC-60825 standards.

There are two versions of the series 10GBASE-BX SFP+ BiDi 10km transceiver. The Standard grade (0~70ºC) is commonly used for commercial applications, and the Industrial grade (-40~85ºC) is made with robust and reliable components to meet the needs of Industrial Ethernet applications under harsh environmental conditions.

Transceiver functional diagram



Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Maximum Supply Voltage	Vcc	-0.5	4.5	V	
Storage Temperature	T_S	-40	85	°C	
Operating Humidity	RH	5	85	%	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Power Supply Voltage	Vcc	3.13	3.3	3.47	V	
Power Supply Current	Icc			300	mA	
Case Operating Temperature	Tc	0		70	°C	Standard
		-40		85	°C	Industrial
Data Rate		9.95	10.3125	11.3	Gbps	
Maximum Link Length	L_{MAX}			10	km	

Optical Characteristics

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Transmitter						
Operating Wavelength	λ	1260	1270	1280	nm	OPB10G-2310DxR
		1320	1330	1340		OPB10G-3210DxR
Ave. output power (Enabled)	P_{AVE}	-6.0		0	dBm	1
Side-Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	3.5	4.5		dB	
RMS spectral width	Δλ			1	nm	
Rise/Fall time (20%~80%)	Tr/Tf			50	ps	

Dispersion penalty	T_{DP}			3.2	dB	
Relative Intensity Noise	R_{IN}			-128	dB/Hz	
Output Optical Eye	Compliant with IEEE 0802.3ae					
Receiver						
Operating Wavelength	λ	1320	1330	1340	nm	OPB10G-2310DxR
		1260	1270	1280		OPB10G-3210DxR
Receiver Sensitivity(ER=3.5)	P_{SEN1}			-12.6	dBm	2
Receiver Sensitivity(ER=6)	P_{SEN2}			-14.4	dBm	2
Receive Power Overload	P_{AVE}			0.5	dBm	
Receiver Reflectance	R_{rx}			-12	dB	
LOS Assert	Pa	-30			dBm	
LOS De-assert	Pd			-17	dBm	
LOS Hysteresis	Pd-Pa	0.5			dB	

Note:

1. Average power figures are informative only, per IEEE 802.3ae.
2. Measured with worst ER; BER<10^{-12}, 2^{31}-1 PRBS.

Electrical Characteristics

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Transmitter						
Differential data input swing	$V_{IN,PP}$	180		700	mVpp	1
Transmit Disable Voltage	VD	VCC-0.8		Vcc	V	
Transmit Enable Voltage	V_{EN}	Vee		Vee+0.8		
Input differential impedance	Rin		100		Ω	
Receiver						
Differential data output swing	Vout,pp	350		700	mVpp	2
Output rise time and fall time	Tr, Tf	28			Ps	3
LOS asserted	V_{LOS_F}	VCC-0.8		Vcc	V	4
LOS de-asserted	V_{LOS_N}	Vee		Vee+0.8	V	4

Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Into 100Ω 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 4.7kΩ – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1.

Diagnostics

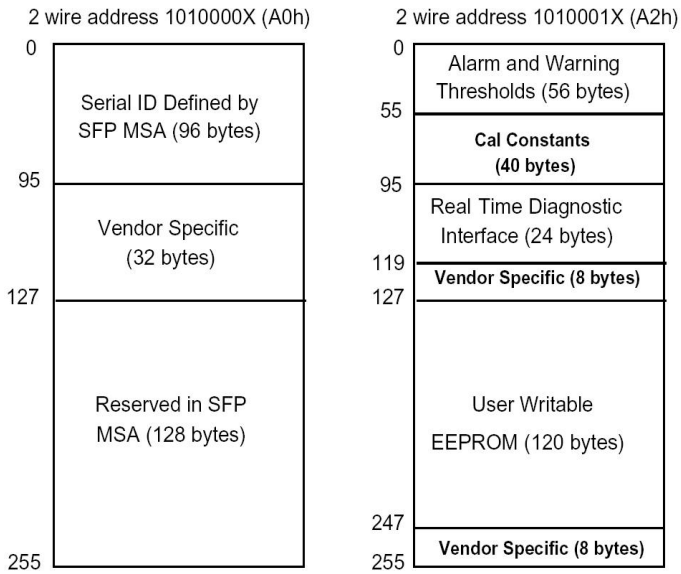
Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal
	-40 to +85			
Voltage	3.0 to 3.6	V	±3%	Internal
Bias Current	0 to 15	mA	±10%	Internal
TX Power	-6.0 to -0.5	dBm	±3dB	Internal
RX Power	-16 to -1	dBm	±3dB	Internal

Digital Diagnostic Memory Map

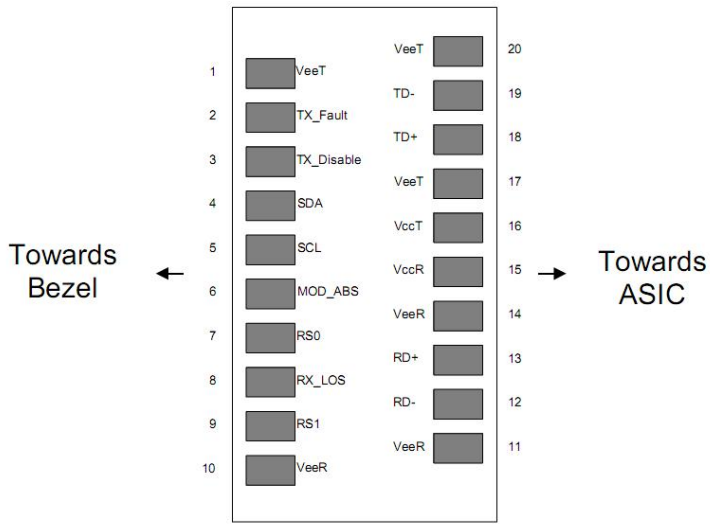
The 10GBASE-BX SFP+ transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

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 Descriptions

Pin	Signal Name	Description	Plug Seq.	Notes
1	V_{EET}	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	SDA	SDA Serial Data Signal	3	
5	SCL	SCL Serial Clock Signal	3	
6	MOD_ABS	Module Absent. Grounded within the module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	Note 3
9	RS1	Not Connected	3	
10	V_{EER}	Receiver ground	1	
11	V_{EER}	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 4
13	RD+	Received Data Out	3	Note 4
14	V_{EER}	Receiver ground	1	
15	V_{CCR}	Receiver Power Supply	2	
16	V_{CCT}	Transmitter Power Supply	2	
17	V_{EET}	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 5
19	TD-	Inv. Transmit Data In	3	Note 5
20	V_{EET}	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.

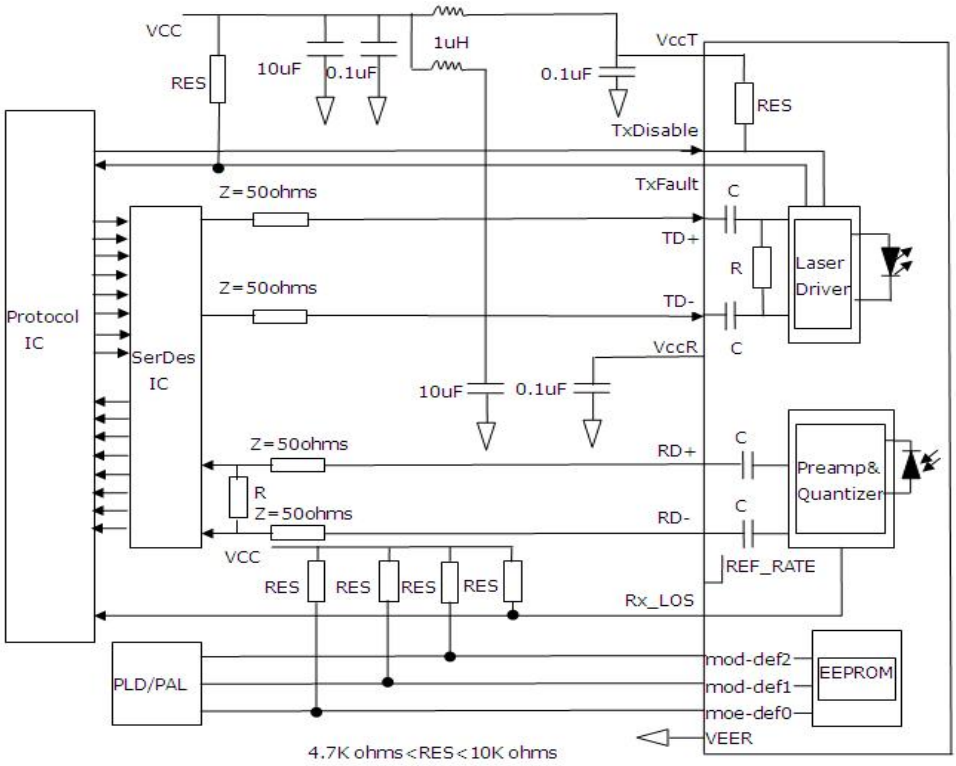
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.

3. LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

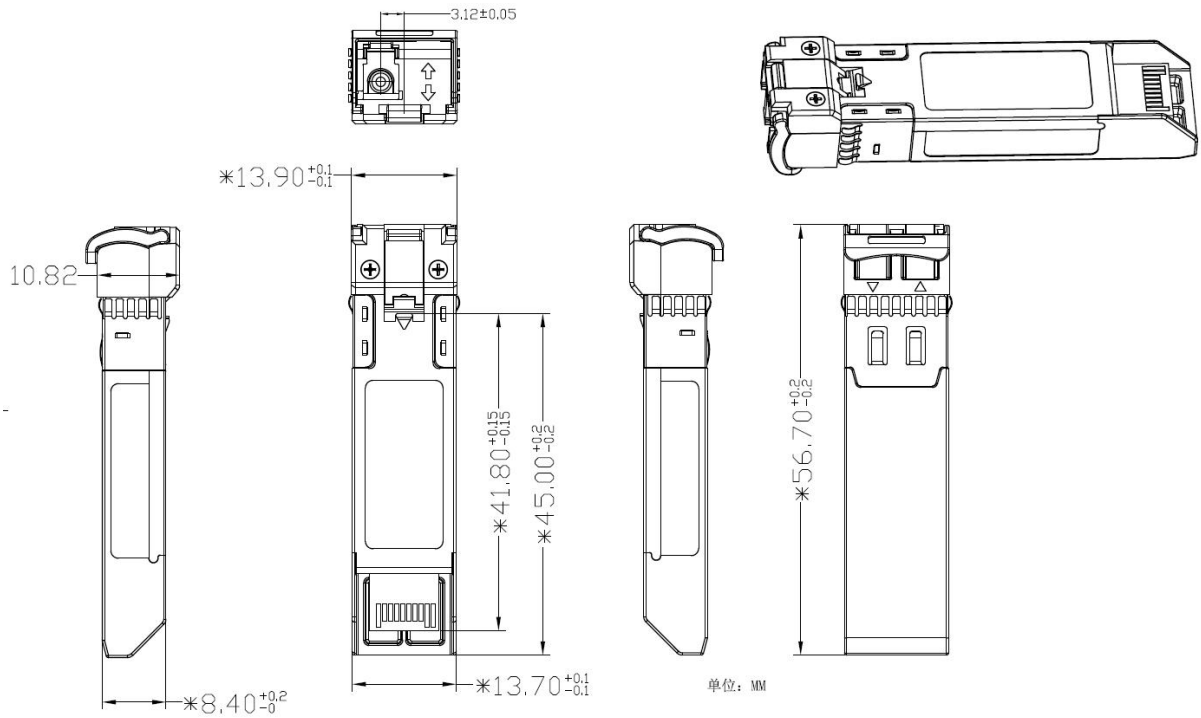
4. RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.

5. 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 Dimensions



Ordering information

Part number	Description
OPB10G-2310DCR	10GBASE-BX SFP+ Transceiver, 1270nm-TX/1330nm-RX, 10km, LC, DDM, 0ºC~+70ºC
OPB10G-3210DCR	10GBASE-BX SFP+ Transceiver, 1330nm-TX/1270nm-RX, 10km, LC, DDM, 0ºC~+70ºC

OPB10G-2310DTR	10GBASE-BX SFP+ Industrial Transceiver, 1270nm-TX/1330nm-RX, 10km, LC, DDM, -40ºC~+85ºC
OPB10G-3210DTR	10GBASE-BX SFP+ Industrial Transceiver, 1330nm-TX/1270nm-RX, 10km, LC, DDM, -40ºC~+85ºC

Warnings

Process plug

The transceiver optics is supplied with a dust cover. This plug protects the transceiver optics during standard manufacturing processes by preventing contamination from air borne particles.It is recommended that the dust cover remain in the transceiver whenever an optical fiber connector is not inserted.

Handling Precautions

The transceiver optics is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety

The transceiver optics is a Class 1 laser product per international standard IEC 60825-1. Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

Appendix A. Document Revision

Version No	Date	Description
DS/V1.0/EN	2018-01-10	Preliminary datasheet
DS/V211028/EN	2021-10-28	Update outline dimension
DS/V3.0/EN	2024-10-29	Add document revision

For more product information, visit us on the web at www.optcore.net