

OPB1250-45A6DxR / OPB1250-54A6DxR

1.25G BiDi SFP Transceiver, SMF, 1490nm-TX/1550nm-RX or 1550nm-TX/1490nm-RX, 160km, LC, DDM



Features

- Support up to 1.25Gb/s data links
- Compliant with SFP MSA standard
- Hot pluggable SFP footprint
- Single 3.3V power supply
- Built-in Digital Diagnostic Monitor Interface
- Simplex LC connector for Bi-Directional transmission
- 1490nm DFB laser and 1550nm APD photo detector
- 1550nm DFB laser and 1490nm APD photo detector
- Applicable for 160km SMF connection
- Low power dissipation <1.2W
- Metal enclosure provides lower EMI
- RoHS compliant and lead-free
- Operating Temperature: Standard 0~70°C, Industrial -40~85°C

Applications

- 1G Fiber Channel, Switch to Switch Interface
- Gigabit Ethernet, Switched Backplane Applications
- Broadband aggregation and wireless infrastructure
- Router/Server Interface
- Other Optical networking

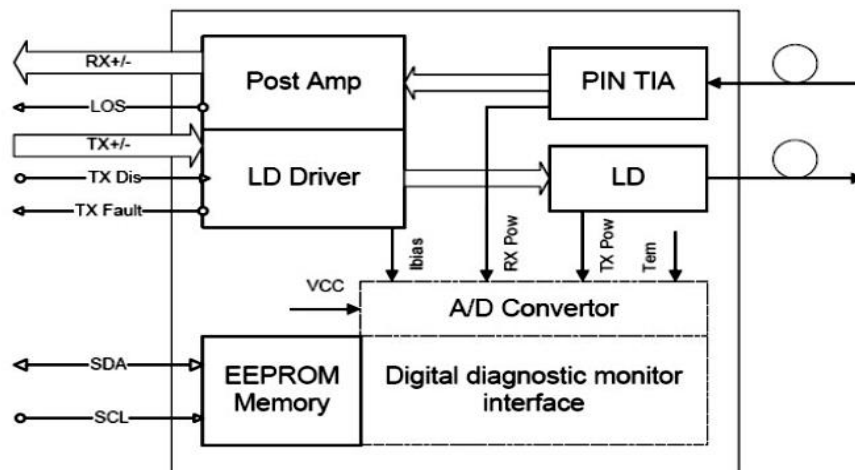
Description

Optcore OPB1250-45(54)A6DxR family are high-performance, cost-effective SFP BiDi modules supporting dual data rate of 1.25Gbps/1.06Gbps and 140km-160km transmission distance with SMF. The transceiver consists of three sections: an DFB laser transmitter, a APD photodiode integrated with a trans-impedance preamplifier (TIA), and an MCU control unit. All modules satisfy class I laser safety requirements. The transceivers are compatible with the SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.

This series 1G BiDi SFP 160km transceiver provides two versions for different applications.

- The standard commercial-grade BiDi SFP transceiver (OPB1250-45A6DCR / OPB1250-54A6DCR) supports operating temperature 0~70° for commercial applications and at a lower cost.
- The Industrial grade BiDi SFP transceiver (OPB1250-45A6DTR / OPB1250-54A6DTR) supports operating temperature -40~85°C. It is made with robust and reliable components to meet the needs of Industrial Ethernet application under harsh industrial environmental conditions, such as industrial automation, government, rail, and intelligent transportation systems (ITSs), military, oil and gas, mining, and outdoor applications.

Functional Diagram



Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Maximum Supply Voltage	Vcc	-0.5	4.0	V	
Storage Temperature	Ts	-40	85	°C	
Operating Humidity	RH	5	95	%	

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			350	mA	
Case Operating Temperature	Tc	0		70	°C	Standard
		-40		85	°C	Industrial
Data Rate			1.25		Gbps	Gigabit Ethernet

			1.06		Gbps	Fiber Channel
Transmission Distance			150	160	km	9/125µm SMF

Optical Characteristics

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Transmitter						
Operating Wavelength	λ	1470	1490	1510	nm	OPB1250-45A6DxR
		1510	1550	1570		OPB1250-54A6DxR
Ave. output power (Enabled)	P_{AVE}	1		6	dBm	1
Extinction Ratio	ER	9			dB	1
Side-Mode Suppression Ratio	SMSR	30			dB	
RMS spectral width	$\Delta\lambda$			1	nm	
Rise/Fall time (20%~80%)	Tr/Tf			0.26	ns	2
Dispersion penalty	TDP			3.9	dB	
Output Optical Eye	Compliant with IEEE802.3 z (class 1 Laser safety)					
Receiver						
Operating Wavelength	λ	1510	1550	1570	nm	OPB1250-45A6DxR
		1470	1490	1510		OPB1250-54A6DxR
Receiver Sensitivity	P_{SEN1}			-34	dBm	3
Overload	P_{AVE}	-9			dBm	3
LOS Assert	P_a	-40			dBm	
LOS De-assert	P_d			-35	dBm	
LOS Hysteresis	$P_d - P_a$	0.5			dB	

Note :

1. Measured at 1.25Gbps with PRBS 2⁷-1 NRZ test pattern.
2. Unfiltered, measured with a PRBS 2⁷-1 test pattern @1.25Gbps
3. Measured at 1250 Mb/s with PRBS 2⁷-1 NRZ test pattern for BER < 1x10⁻¹²

Electrical Characteristics

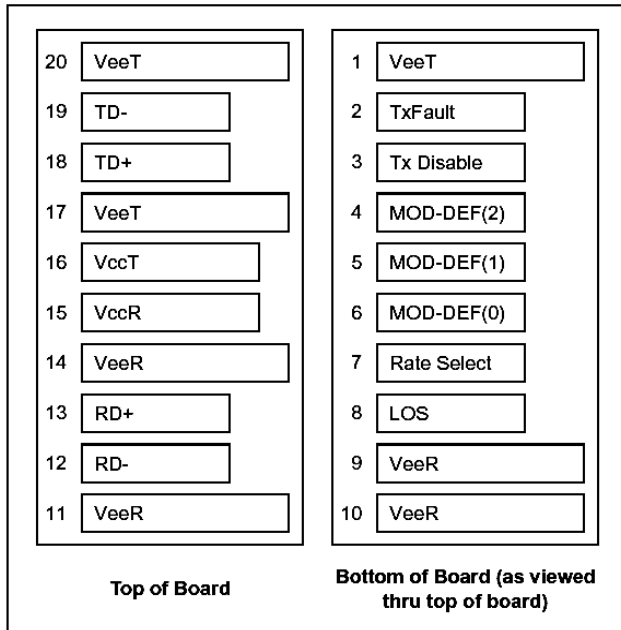
Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Transmitter						
Differential data input swing	$V_{IN,PP}$	120		820	mVpp	1
Tx Disable Input-High	V_{IH}	2.0		$V_{CC}+0.3$	V	
Tx Disable Input-Low	V_{IL}	0		0.8	V	
Tx Fault Output-High	V_{OH}	2.0		$V_{CC}+0.3$	V	2
Tx Fault Output-Low	V_{OL}	0		0.8	V	2
Input differential impedance	R_{in}		100		Ω	
Receiver						
Differential data output swing	$V_{out,pp}$	340	650	800	mVpp	3
Rx LOS Output-High	V_{ROH}	2.0		$V_{CC}+0.3$	V	2

Rx LOS Output-Low	VROL	0	0.8	V	2
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Notes:

1. TD+/- are internally AC coupled with 100Ω differential termination inside the module.
2. Tx Fault and Rx LOS are open collector outputs, which should be pulled up with 4.7k to 10kΩ resistors on the host board. Pull up voltage between 2.0V and Vcc+0.3V.
3. RD+/- outputs are internally AC coupled, and should be terminated with 100Ω (differential) at the user SERDES.

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	MOD_DEF(2)	SDA Serial Data Signal	3	Note 3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3
6	MOD_DEF(0)	Model present indication	3	Note 3
7	Rate Select	Not Connected	3	
8	LOS	Loss of Signal	3	Note 4
9	V _{EER}	Receiver ground	1	
10	V _{EER}	Receiver ground	1	
11	V _{EER}	Receiver ground	1	
12	RD-	Inverse Received Data Out	3	Note 5
13	RD+	Received Data Out	3	Note 5
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 6
19	TD-	Inv. Transmit Data In	3	Note 6
20	V _{EET}	Transmitter Ground	1	

Notes:

- 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 V_{cc}+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.
- 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
- 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 V_{ccT} or V_{ccR}.
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
- LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and V_{cc}+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.
- 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.
- TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

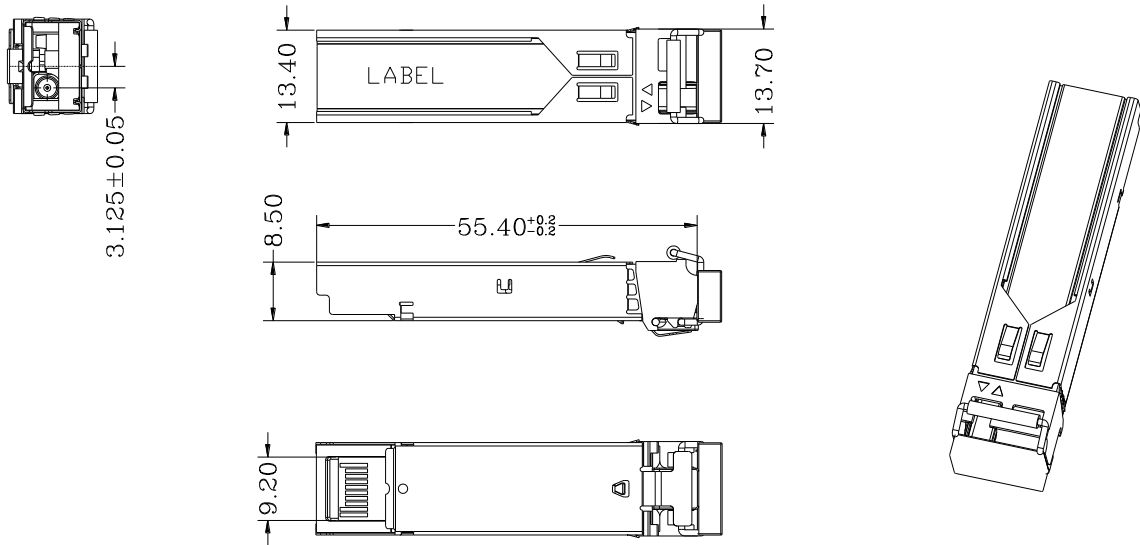
Digital Diagnostic Functions

Optcore 1.25Gb/s BiDi SFP 160km optical transceiver supports the 2-wire serial communication protocol as defined in the SFP MSA. It is very closely related to the EEPROM defined in the GBIC standard, with the same electrical specifications. The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

Optcore 1.25Gb/s BiDi SFP 160km optical transceiver provides an optional enhanced digital diagnostic monitoring (DDM/DOM) interface. It 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 alarm and warning flags system, which alerts end-users when particular operating parameters are outside of a factory set normal range.

Digital diagnostics for this 1.25G BiDi SFP 160km optical transceiver is internally calibrated by default.

Mechanical Dimensions



Units in mm
Tolerance without indication is ±0.1mm

Ordering Information

Part number	Description
OPB1250-45A6DCR	1.25G BiDi SFP Transceiver, SMF, 1490nm-TX/1550nm-RX, 160km, LC, DDM, 0°C~+70°C
OPB1250-54A6DCR	1.25G BiDi SFP Transceiver, SMF, 1550nm-TX/1490nm-RX, 160km, LC, DDM, 0°C~+70°C
OPB1250-45A6DTR	1.25G BiDi SFP Industrial Transceiver, SMF, 1490nm-TX/1550nm-RX, 160km, LC, DDM, -40°C~+85°C
OPB1250-54A6DTR	1.25G BiDi SFP Industrial Transceiver, SMF, 1550nm-TX/1490nm-RX, 160km, LC, DDM, -40°C~+85°C

⚠ Warnings

Process plug

The transceiver module 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 module 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 module 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/V180227/EN	2018-02-27	Preliminary datasheet
DS/V2.0/EN	2024-10-23	Delete Non-DDM and extend temperature P/N
DS/V4.0/EN	2025-04-25	Update Logo, datasheet template, product image

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



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