

## Instantly Double Your Bandwidth Capacity of Fiber Optics Networks!

### Features

- One single fiber to transmit and receive simultaneously
- 1270/1330 nm or 1490/1550 nm wavelength matching pair
- 9.95 – 11 Gb/s, 10 - 80 km
- SFP+ MSA compliant
- Single LC connector, Z-axis hot pluggable package
- AC coupling LVPECL differential I/Os,
- TTL RX\_LOS signal detect

### Applications

- ✓ FTTH, FTTX, ATM/SONET, SDH, Ethernet
- ✓ 10 Gigabit Ethernet, 10G Fiber Channel
- ✓ Video over fiber links, media converters
- ✓ High speed I/O bus extension, systems interconnects
- ✓ Data Communication for SAN and LAN
- ✓ Routers and switches, computer cluster cross-connect



**Only one single fiber is needed for  
Bi-Directional data communication!!**

### Products Selection Guide

Part Number *	TX Wavelength	Data Rate	Power Budget	Distance**	Temp. Range
<b>10 Gb/s, Single Mode Applications, 10 – 60 km</b>					
BD4-10000T2R3-AT10K	1270 nm	10 Gb/s	9 dB	10 km	0 – 70/-40 – 85°C
BD4-10000T3R2-AT10K	1330 nm	10 Gb/s	9 dB	10 km	0 – 70/-40 – 85°C
BD4-10000T2R3-AT20K	1270 nm	10 Gb/s	12 dB	20 km	0 – 70/-40 – 85°C
BD4-10000T3R2-AT20K	1330 nm	10 Gb/s	12 dB	20 km	0 – 70/-40 – 85°C
BD4-10000T2R3-AT40K	1270 nm	10 Gb/s	16 dB	40 km	0 – 70/-40 – 85°C
BD4-10000T3R2-AT40K	1330 nm	10 Gb/s	16 dB	40 km	0 – 70/-40 – 85°C
BD4-10000T2R3-AT60K	1270 nm	10 Gb/s	20 dB	60 km	0 – 70/-40 – 85°C
BD4-10000T3R2-AT60K	1330 nm	10 Gb/s	20 dB	60 km	0 – 70/-40 – 85°C
BD4-10000T4R5-AT80K	1490 nm	10 Gb/s	24 dB	80 km	0 – 70/-40 – 85°C
BD4-10000T5R4-AT80K	1550 nm	10 Gb/s	24 dB	80 km	0 – 70/-40 – 85°C

\*: Add "-T" in the Part Number for products with extended temperature range -40–85 °C. For example, BD4-10000T2R3-AT10K-T.

\*\* : The indicated distance is for reference only, not guaranteed specifications. The actual transmission distance depends on system configuration and power budget. For single mode fibers, the typical loss is 0.25 dB/km @ 1550 nm and 0.35 dB/km @ 1310 nm.

**10 Gb/s, SFP+ LC Package, BIDI  
TX 1270/RX1330, TX 1330/RX1270 nm  
Single Mode, 10-60 km Distance**



**SFP+ Bi-Directional (BiDi) Transceivers**

**Description**

The bi-directional (BIDI) transceiver product is unique in that only one single fiber (single mode or multimode) is required to transmit and receive signals simultaneously. That means the total bandwidth capacity of an existing cable infrastructure can be doubled instantly. The typical design of a BIDI transceiver uses a 1270 nm LD to transmit and 1330 nm PD to receive, and vice versa for the matching one (1270 nm to receive and 1330 nm to transmit) at the other end to make a complete link.

OptixCom's SFP+ transceivers are compliant with SFP Multi-Source Agreement (MSA). The BIDI transceivers utilize advanced filter optics to separate the two wavelength with more than 40 dB of isolation. These transceivers operate at 10 Gb/s for 10-60 km transmission distance with single fibers. The products are RoHS compliant.



Lead-Free

**BD4-10000T2R3-ATXXK  
BD4-10000T3R2-ATXXK  
(XX = 10, 20, 40, 60)**



**Key Features**

- Single mode, 10 G/s data rate
- TX1270/RX1330 & TX1330/RX1270 nm pair
- > 6 dB power budget for 10 km
- > 12 dB power budget for 20 km
- > 16 dB power budget for 40 km
- > 20 dB power budget for 60 km
- Z-axis hot pluggable
- SFF-8472 MSA Compliant
- Single LC connector optical interface
- AC coupling LVPECL differential I/O logics
- -40-85 °C operating temperatures available
- Compliant with 10G FC Fiber Channel
- RoHS compliant

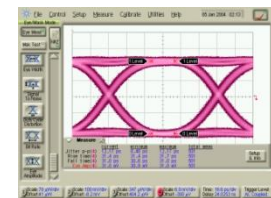
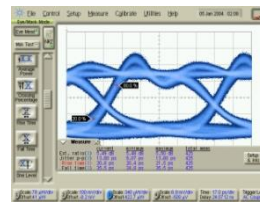
**Applications**

- ✓ 10G Fiber Channel,
- ✓ 10 Gigabit Ethernet
- ✓ High speed I/O for file server
- ✓ Data Communication for SAN and LAN
- ✓ Central offices routers and switches
- ✓ Computer cluster cross-connect

10 Gb/s, 2<sup>31</sup>-1 NRZ data eye pattern

TX

RX



**Ordering Information**

**Part Number:** BD4-10000T2R3-ATXXK

10 Gb/s, Single Mode, SFP+ BIDI Transceiver, TX 1270 nm and RX 1330 nm, **XX** km reach, 0 – 70 °C.

**Part Number:** BD4-10000T3R2-ATXXK

10 Gb/s, Single Mode, SFP+ BIDI Transceiver, TX 1330 nm and RX 1270 nm, **XX** km reach, 0 – 70 °C.

\* Add "-T" in the Part Number for -40-85 °C extended temperature range, i.e., BD4-10000T2R3-AT20K-T.

**Operating Conditions**

Parameter	Min.	Typical	Max.	Units
Operate Temperature	0	25	70	°C
- T Transceivers	-40	25	85	°C
Data Rate	9.95	---	11	Gb/s
Supply Voltage (3.3V)	3.13	3.3	3.47	V

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### Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units
Storage Temperature	$T_{st}$	-40	85	°C
Supply Voltage @ 3.3V	$V_{CC}$	-0.5	3.6	V
Input Voltage	$V_{IN}$	-0.5	$V_{CC}$	V
Relative Humidity	$R.H.$	0	85	%

### General Transmitter Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Differential Input Voltage <sup>1</sup>	$\Delta V_i$	0.2	---	1.2	V
Differential Input Impedance <sup>2</sup>	$Z$	---	100	---	ohm
Side Mode Suppression Ratio	SMSR	30	---	---	dB
Relative Intensity Noise	$RIN$	---	---	-128	dB/Hz
Rise/Fall Time (20% - 80%)	$T_r/T_f$	---	---	40	ps
TX Disable Voltage – High	$V_{DH}$	2.0	---	$V_{CC}$	V
TX Disable Voltage - Low	$V_{DL}$	0	---	0.8	V
TX Fault Output - High	$V_{FH}$	2.0	---	$V_{CC}$	V
TX Fault Output - Low	$V_{FL}$	0	---	0.8	V
TX Disable Assert Time	$T_{ass}$	---	---	10	μs
TX Disable Deassert Time	$T_{disass}$	---	---	1.0	ms
Time to Initialize	$T_{as}$	---	---	300	ms
TX Fault from Fault to Assertion	$T_{fault}$	---	---	100	μs
TX Disable Time to Start Reset	$T_{reset}$	10	---	---	μs

Notes:

1. Module is designed for AC LVPECL coupling. See the design guide for proper termination.
2. Single ended will be 50 ohm for each signal line.

**Class 1 Laser Product**  
Complies with  
21 CFR 1040.10 and 1040.11



### General Receiver Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Differential Output Voltage <sup>1</sup>	$\Delta V_o$	0.3	---	0.7	V
Differential Input Impedance <sup>2</sup>	Z	---	100	---	Ohm
Optical Return Loss	OL	12	---	---	dB
Rise/Fall Time (20% - 80%)	$T_r/T_f$	---	---	40	ps
RX Signal Loss Output - High	$V_{RL+}$	2.0	---	$V_{CC}$	V
RX Signal Loss Output - Low	$V_{RL-}$	0	---	0.8	V
RX Signal Loss Assert Time	$T_{RL+}$	---	---	100	$\mu$ s
RX Signal Loss Deassert Time	$T_{RL-}$	---	---	100	$\mu$ s
Serial ID Clock Rate	$f_C$	---	---	100	kHz

Notes:

1. Module is designed for AC LVPECL coupling. See the design guide for proper termination.
2. Single ended will be 50 ohm for each signal line.

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Complies with  
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### Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Optical Output Power <sup>1</sup>	$P_o$	-6	---	-1	dBm
Optical Wavelength (BD4-1000T2R3-AT10K)	$\lambda_o$	1260	1270	1280	nm
Optical Wavelength (BD4-1000T3R2-AT10K)	$\lambda_o$	1320	1330	1340	nm
Extinction Ratio	$ET$	3.5	---	---	dB
Spectral Width (-20 dB)	$\Delta\lambda$	---	---	1	nm
TX Disable Asserted	$P_{OFF}$	---	---	-40	dBm

### Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Operating Wavelength (BD4-1000T2R3-AT10K)	$\lambda_c$	1320	1330	1340	nm
Operating Wavelength (BD4-1000T3R2-AT10K)	$\lambda_c$	1260	1270	1280	nm
Receiver Overload	$P_{max}$	+0.5	---	---	dBm
Receiver Sensitivity <sup>2</sup>	$P_I$	---	---	-15	dBm
Receiver Sensitivity in OMA <sup>2</sup>	$P_I$	---	---	-13	dBm
RX Signal Loss – Asserted	$P_{RL+}$	---	---	-17	dBm
RX Signal Loss – Deasserted	$P_{RL-}$	-30	---	---	dBm

Notes:

1. Output of coupling optical power into 9/125  $\mu\text{m}$  SMF.
2. Test at 10 Gb/s,  $2^{31} - 1$  PRBS data pattern, and  $> 1 \times 10^{-12}$  of Bit-Error-Rate (BER).
3. Power supply current: typical 270 mA, maximum 350 mA

**Class 1 Laser Product**  
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### Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Optical Output Power <sup>1</sup>	$P_o$	-2	---	+2	dBm
Optical Wavelength (BD4-1000T2R3-AT20K)	$\lambda_o$	1260	1270	1280	nm
Optical Wavelength (BD4-1000T3R2-AT20K)	$\lambda_o$	1320	1330	1340	nm
Extinction Ratio	$ET$	3.5	---	---	dB
Spectral Width (-20 dB)	$\Delta\lambda$	---	---	1	nm
TX Disable Asserted	$P_{OFF}$	---	---	-30	dBm

### Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Operating Wavelength (BD4-1000T2R3-AT20K)	$\lambda_c$	1320	1330	1340	nm
Operating Wavelength (BD4-1000T3R2-AT20K)	$\lambda_c$	1260	1270	1280	nm
Receiver Overload	$P_{max}$	+0.5	---	---	dBm
Receiver Sensitivity <sup>2</sup>	$P_I$	---	---	-14	dBm
Receiver Sensitivity in OMA <sup>2</sup>	$P_I$	---	---	-12.5	dBm
RX Signal Loss – Asserted	$P_{RL+}$	---	---	-15	dBm
RX Signal Loss – Deasserted	$P_{RL-}$	-30	---	---	dBm

Notes:

1. Output of coupling optical power into 9/125  $\mu\text{m}$  SMF.
2. Test at 10 Gb/s,  $2^{31} - 1$  PRBS data pattern, and  $> 1 \times 10^{-12}$  of Bit-Error-Rate (BER).

Class 1 Laser Product  
Complies with  
21 CFR 1040.10 and 1040.11



### Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Optical Output Power <sup>1</sup>	$P_o$	+1	---	+5	dBm
Optical Wavelength (BD4-1000T2R3-AT40K)	$\lambda_o$	1260	1270	1280	nm
Optical Wavelength (BD4-1000T3R2-AT40K)	$\lambda_o$	1320	1330	1340	nm
Extinction Ratio	$ET$	3.5	---	---	dB
Spectral Width (-20 dB)	$\Delta\lambda$	---	---	1	nm
TX Disable Asserted	$P_{OFF}$	---	---	-30	dBm

### Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Operating Wavelength (BD4-1000T2R3-AT40K)	$\lambda_c$	1320	1330	1340	nm
Operating Wavelength (BD4-1000T3R2-AT40K)	$\lambda_c$	1260	1270	1280	nm
Receiver Overload	$P_{max}$	+1	---	---	dBm
Receiver Sensitivity <sup>2</sup>	$P_I$	---	---	-15	dBm
Receiver Sensitivity in OMA <sup>2</sup>	$P_I$	---	---	-13	dBm
RX Signal Loss – Asserted	$P_{RL+}$	---	---	-17	dBm
RX Signal Loss – Deasserted	$P_{RL-}$	-32	---	---	dBm

Notes:

1. Output of coupling optical power into 9/125  $\mu\text{m}$  SMF.
2. Test at 10 Gb/s, 2<sup>31</sup> – 1 PRBS data pattern, and > 1x10<sup>-12</sup> of Bit-Error-Rate (BER).
3. Power supply current: maximum 450 mA.

**Class 1 Laser Product**  
Complies with  
**21 CFR 1040.10 and 1040.11**



### Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Optical Output Power <sup>1</sup>	$P_o$	0	---	+5	dBm
Optical Wavelength (BD4-1000T2R3-AT60K)	$\lambda_o$	1260	1270	1280	nm
Optical Wavelength (BD4-1000T3R2-AT60K)	$\lambda_o$	1320	1330	1340	nm
Extinction Ratio	$ET$	3.5	---	---	dB
TX Disable Asserted	$P_{OFF}$	---	---	-30	dBm

### Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Operating Wavelength (BD4-1000T2R3-AT60K)	$\lambda_c$	1320	1330	1340	nm
Operating Wavelength (BD4-1000T3R2-AT60K)	$\lambda_c$	1260	1270	1280	nm
Receiver Overload	$P_{max}$	-6	---	---	dBm
Receiver Sensitivity <sup>2</sup>	$P_I$	---	---	-20	dBm
Receiver Sensitivity in OMA <sup>2</sup>	$P_I$	---	---	-18	dBm
RX Signal Loss – Asserted	$P_{RL+}$	---	---	-21	dBm
RX Signal Loss – Deasserted	$P_{RL-}$	-35	---	---	dBm

Notes:

1. Output of coupling optical power into 9/125  $\mu$ m SMF.
2. Test at 10 Gb/s, 2<sup>31</sup> – 1 PRBS data pattern, and > 1x10<sup>-12</sup> of Bit-Error-Rate (BER).
3. Power supply current: maximum 450 mA.

**Class 1 Laser Product**  
Complies with  
**21 CFR 1040.10 and 1040.11**





# 10 Gb/s, SFP+ LC Package, BIDI TX 1490/RX1550, TX 1550/RX1490 nm Single Mode, 80 km Distance



**SFP+ Bi-Directional (BiDi) Transceivers**

## Description

The bi-directional (BIDI) transceiver product is unique in that only one single fiber (single mode or multimode) is required to transmit and receive signals simultaneously. That means the total bandwidth capacity of an existing cable infrastructure can be doubled instantly. This long range BIDI transceiver uses EML 1490 nm LD to transmit and 1550 nm APD to receive, and vice versa for the matching one (1490 nm to receive and 1550 nm to transmit) at the other end to make a complete link.

OptixCom's SFP+ transceivers are compliant with SFP Multi-Source Agreement (MSA). The BIDI transceivers utilize advanced filter optics to separate the two wavelength with low power consumption of < 2W. These transceivers operate at 10 Gb/s for 80 km transmission distance with single mode fibers. The products are RoHS compliant.



Lead-Free

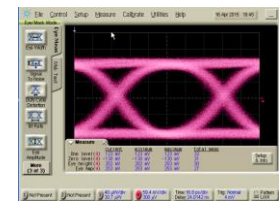
**BD4-10000T4R5-AT80K**  
**BD4-10000T5R4-AT80K**



10 Gb/s, 2<sup>31</sup>-1 NRZ data eye pattern

TX

RX



## Key Features

- Single mode, 10 G/s data rate
- TX1490/RX1550 & TX1550/RX1490 nm pair
- > 24 dB power budget for 80 km
- Z-axis hot pluggable
- SFF-8472 MSA Compliant
- Single LC connector optical interface
- AC coupling LVPECL differential I/O logics
- -40–85 °C operating temperatures available
- Single 3.3V power supply
- RoHS compliant

## Applications

- ✓ 10G Fiber Channel,
- ✓ 10 Gigabit Ethernet
- ✓ High speed I/O for file server
- ✓ Data Communication for SAN and LAN
- ✓ Central offices routers and switches
- ✓ Computer cluster cross-connect

## Ordering Information

**Part Number:** BD4-10000T4R5-AT80K

10 Gb/s, Single Mode, SFP+ BIDI Transceiver, TX 1490 nm and RX 1550 nm, 80 km reach, 0 – 70 °C.

**Part Number:** BD4-10000T5R4-AT80K

10 Gb/s, Single Mode, SFP+ BIDI Transceiver, TX 1550 nm and RX 1490 nm, 80 km reach, 0 – 70 °C.

\* Add "-T" in the Part Number for -40–85 °C extended temperature range, i.e., BD4-10000T4R5-AT80K-T.

## Operating Conditions

Parameter	Min.	Typical	Max.	Units
Operate Temperature	0	25	70	°C
Data Rate	9.95	---	11	Gb/s
Supply Voltage (3.3V)	3.13	3.3	3.47	V
Supply Current	---	350	450	mA

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### Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units
Storage Temperature	$T_{st}$	-40	85	°C
Supply Voltage @ 3.3V	$V_{CC}$	-0.3	3.8	V
Input Voltage	$V_{IN}$	-0.5	$V_{CC}$	V
Relative Humidity	$R.H.$	5	95	%

### Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Differential Input Voltage <sup>1</sup>	$\Delta V_i$	0.2	---	1.2	V
Differential Input Impedance <sup>2</sup>	$Z$	---	100	---	ohm
Optical Power	$P_o$	0	---	+4	dBm
Optical Wavelength (BD4-10000T4R5-AT80K)	$\lambda_o$	1480	1490	1500	nm
Optical Wavelength (BD4-10000T5R4-AT80K)	$\lambda_o$	1540	1550	1560	nm
Spectral Width (-20 dB)	$\Delta\lambda$	---	---	0.3	nm
TX Disable Asserted	$P_{OFF}$	---	---	-30	dBm
Side Mode Suppression Ratio	$SMSR$	30	---	---	dB
Extinction Ratio	$ET$	7.5	---	---	dB
Rise/Fall Time (20% - 80%)	$T_r/T_f$	---	---	40	ps
TX Disable Voltage – High	$V_{DH}$	2.0	---	$V_{CC}$	V
TX Disable Voltage - Low	$V_{DL}$	0	---	0.8	V
TX Fault Output - High	$V_{FH}$	2.4	---	$V_{CC}$	V
TX Fault Output - Low	$V_{FL}$	0	---	0.8	V
TX Disable Assert Time	$T_{ass}$	---	---	10	μs
TX Disable Deassert Time	$T_{disass}$	---	---	1.0	ms
Time to Initialize	$T_{as}$	---	---	300	ms
TX Fault from Fault to Assertion	$T_{fault}$	---	---	100	μs
TX Disable Time to Start Reset	$T_{reset}$	10	---	---	μs

Notes:

1. Module is designed for AC LVPECL coupling. See the design guide for proper termination.
2. Single ended will be 50 ohm for each signal line.
3. Output of coupling optical power into 9/125 μm SMF.

### Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Differential Output Voltage <sup>1</sup>	$\Delta V_o$	0.3	---	0.8	V
Differential Input Impedance <sup>2</sup>	$Z$	---	100	---	Ohm
Optical Wavelength (BD4-10000T4R5-AT80K)	$\lambda_c$	1540	1550	1560	nm
Optical Wavelength (BD4-10000T5R4-AT80K)	$\lambda_c$	1480	1490	1500	nm
Receiver Overload	$P_{max}$	-6	---	---	dBm
Receiver Sensitivity <sup>3</sup>	$P_i$	---	---	-24	dBm
RX Signal Loss – Asserted	$P_{RL+}$	---	---	-25	dBm
RX Signal Loss – Deasserted	$P_{RL-}$	-35	---	---	dBm
Rise/Fall Time (20% - 80%)	$T_r/T_f$	---	---	40	ps
RX Signal Loss Output - High	$V_{RL+}$	2.0	---	$V_{CC}$	V
RX Signal Loss Output - Low	$V_{RL-}$	0	---	0.8	V
RX Signal Loss Assert Time	$T_{RL+}$	---	---	100	$\mu$ s
RX Signal Loss Deassert Time	$T_{RL-}$	---	---	100	$\mu$ s
Serial ID Clock Rate	$f_c$	---	---	100	kHz

Notes:

1. Module is designed for AC LVPECL coupling. See the design guide for proper termination.
2. Single ended will be 50 ohm for each signal line.
3. Test at 10 Gb/s,  $2^{31} - 1$  PRBS data pattern, and  $> 1 \times 10^{-12}$  of Bit-Error-Rate (BER).