

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

### Features

- One single fiber to transmit and receive simultaneously
- 1270/1330 nm wavelength matching pair
- 9.95 – 11.3 Gb/s, up to 20 km
- XFP MSA and IEEE 802.3ae 10GBASE compliant
- Simplex LC optical connector
- 30-pin connector z-axis hot pluggable
- AC coupling LVPECL differential I/O, TTL signal detect

### Applications

- ✓ FTTH, FTTX, ATM/SONET, SDH, Ethernet
- ✓ 10 Gigabit Ethernet, 10G Fiber Channel
- ✓ 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
10 Gb/s, Single Mode Applications, 10 – 20 km					
BD6-10000T2R3-AT10K	1270 nm	10 Gb/s	9 dB	10 km	0 – 70/-20 – 85 C
BD6-10000T3R2-AT10K	1330 nm	10 Gb/s	9 dB	10 km	0 – 70/-20 – 85 C
BD6-10000T2R3-AT20K	1270 nm	10 Gb/s	12 dB	20 km	0 – 70/-20 – 85 C
BD6-10000T3R2-AT20K	1330 nm	10 Gb/s	12 dB	20 km	0 – 70/-20 – 85 C

\*: Add "-T" in the Part Number for products with extended temperature range -20-85 °C. For example, BD6-10000T2R3-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.

### 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.

OptoIC's transceivers are compliant with XFP Multi-Source Agreement (MSA) INF-8077i. 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 - 20 km transmission distance with single mode fibers. The products are RoHS compliant. Total power consumption is < 2W.



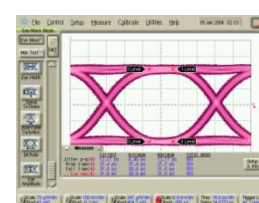
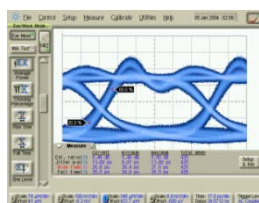
**BD6-10000T2R3-ATXXK**  
**BD6-10000T3R2-ATXXK**  
 (X = 10, 20)



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

**TX**

**RX**



### Key Features

- Single mode, 10 G/s data rate
- TX 1270/RX 1330 and TX 1330/RX1270 matching pair
- > 9 dB power budget for 10 km
- > 12 dB power budget for 20 km
- Simplex LC connector optical interface
- 30-pin Z-axis hot pluggable connector
- AC coupling CML differential I/O logics
- Compliant with XFP MSA standard
- Compliant with IEEE 802.3ae, 10GBASE-SW/SR
- Compliant with 10G FC Fiber Channel Standard
- -20-85 °C operating temperatures available
- 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:** BD6-10000T2R3-ATXXK  
 10 Gb/s, Single Mode, XFP BIDI Transceiver, TX 1270 nm and RX 1330 nm, XX km reach, 0 – 70 °C.

**Part Number:** BD6-10000T3R2-ATXXK  
 10 Gb/s, Single Mode, XFP BIDI Transceiver, TX 1330 nm and RX 1270 nm, XX km reach, 0 – 70 °C.

Add "-T" in the Part Number for extended temperature range -20-85 °C, i.e., BD6-10000T2R3-AT10K-T.

### Operating Conditions

Parameter	Min.	Typical	Max.	Units
Operate Temperature	0	25	70	C
- T Transceivers	-20	25	85	C
Data Rate	9.95	---	11.3	Gb/s
Supply Voltage (3.3V)	3.13	3.3	3.47	V
Supply Voltage (1.8V)	1.71	1.8	1.89	V

**Absolute Maximum Ratings**

Parameter	Symbol	Min.	Max.	Units
Storage Temperature	$T_{st}$	-40	85	C
Supply Voltage @ 3.3V	$V_{CC}$	-0.5	4.0	V
Input Voltage	$V_{IN}$	-0.5	$V_{CC}$	V
Supply Voltage @ 1.8V	$V_{CC}$	-0.5	2.0	V
Output Current	$I_o$	---	50	mA

**General Transmitter Characteristics**

Parameter	Symbol	Min.	Typical	Max.	Units
Differential Input Voltage <sup>1</sup>	$\Delta V_i$	0.2	---	0.8	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	$V_{DH}$	2.4	---	$V_{CC}$	V
TX Disable Voltage - Low	$V_{DL}$	0	---	0.5	V
TX Fault Output - High	$V_{FH}$	2.4	---	$V_{CC}$	V
TX Fault Output - Low	$V_{FL}$	0	---	0.5	V
TX Disable Assert Time	$T_{ass}$	---	---	10	$\mu$ s
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	$\mu$ s
TX Disable Time to Start Reset	$T_{reset}$	10	---	---	$\mu$ s

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
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### General Receiver Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Differential Output Voltage <sup>1</sup>	$\Delta V_o$	0.4	---	0.8	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 – Asserted	$P_{SD+}$	---	---	-18	dBm
RX Signal Loss – Deasserted	$P_{SD-}$	-30	---	---	dBm
RX Signal Loss Output - High	$V_{RL+}$	2.4	---	$V_{CC}$	V
RX Signal Loss Output - Low	$V_{RL-}$	0	---	0.5	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	$f_C$	1/64 of operating data rate			kHz

Notes:

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### Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Optical Output Power <sup>1</sup>	$P_o$	-5	---	0	dBm
Optical Wavelength (BD6-10000T2R3-AT10K)	$\lambda_o$	1260	1270	1280	nm
Optical Wavelength (BD6-10000T3R2-AT10K)	$\lambda_o$	1320	1330	1340	nm
Extinction Ratio	$ET$	8.2	---	---	dB
TX Disable Asserted	$P_{OFF}$	---	---	-30	dBm

### Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Operating Wavelength (BD6-10000T3R2-AT10K)	$\lambda_c$	1320	1330	1340	nm
Operating Wavelength (BD6-10000T2R3-AT10K)	$\lambda_c$	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	$P_{RL+}$	---	---	-18	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<sup>31</sup> – 1 PRBS data pattern, and > 1x10<sup>-12</sup> of Bit-Error-Rate (BER).

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 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>	$P_o$	-2	---	+3	dBm
Optical Wavelength (BD6-10000T2R3-AT10K)	$\lambda_o$	1260	1270	1280	nm
Optical Wavelength (BD6-10000T3R2-AT10K)	$\lambda_o$	1320	1330	1340	nm
Extinction Ratio	$ET$	8.2	---	---	dB
TX Disable Asserted	$P_{OFF}$	---	---	-30	dBm

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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	$P_{RL+}$	---	---	-18	dBm
RX Signal Loss – Deasserted	$P_{RL-}$	-30	---	---	dBm

Notes:

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

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