

AFBR-0549Z/AFBR-0550Z

Evaluation Kits for the HFBR-1414PTZ Fiber Optic Transmitter
and the AFBR-2418TZ/AFBR-2419TZ Fiber Optic Receivers



Application Note 5577

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1. Ordering Information

Since the evaluation board discussed in this application note can be mounted with two different receivers, there are two product numbers for this item:

1. Product No. AFBR-0549Z: evaluation board mounted with the Avago HFBR-1414PTZ fiber optic transmitter and the Avago AFBR-2418TZ fiber optic receiver.
2. Product No. AFBR-0550Z: evaluation board mounted with the Avago HFBR-1414PTZ fiber optic transmitter and the Avago AFBR-2419TZ fiber optic receiver.

Note: The main difference between AFBR-2418TZ and AFBR-2419TZ is that the former covers an input data rate ranging from DC to 50 MBd, while the data rate covered by the latter ranges from 100 kBd to 50 MBd.

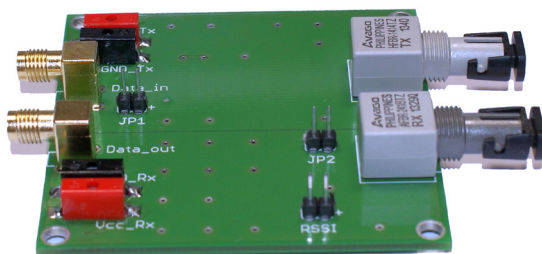


Figure 1. Evaluation board for the HFBR-1414PTZ transmitter module and the AFBR-2418TZ and AFBR-2419TZ receiver modules.

2. Evaluation Board

The evaluation board gives the system designer a convenient means to evaluate the performance of the HFBR-1414PTZ fiber optic transmitter and the AFBR-2418TZ/2419TZ fiber optic receivers.

As shown in Figure 1, the evaluation board is mounted with an HFBR-1414PTZ module, which will be used as the reference transmitter; an AFBR-2418TZ or an AFBR-2419TZ module; two SMA connectors for input/output signals; and two 2-pin headers, one for monitoring the electrical input signal supplied to the transmitter section of the evaluation board (JP1) and the other one for monitoring the electrical output signal generated by the receiver (JP2). For monitoring these two signals, a high-impedance probe must be used. An extra 2-pin header is also available to measure the RSSI-equivalent voltage (RSSI). This voltage is measured through a 2 k Ω resistor. The evaluation board is equipped with four 2 mm jacks for the 5.0 V supply voltage for both the transmitter and the receiver.

This application note describes the evaluation printed circuit board (PCB), the test equipment, and the methods for evaluating the electrical characteristics of the HFBR-1414PTZ, AFBR-2418TZ and AFBR-2419TZ modules.

3. Evaluation kit

The evaluation kit includes:

- Evaluation board with HFBR-1414PTZ module, AFBR-2418TZ or AFBR-2419TZ module, two SMA connectors, three 2-pin headers, four 2 mm jack connectors and electronic components mounted on the bottom side of PCB.
- 1-meter-long ST/ST 62.5 μm multimode fiber.
- 1-meter-long ST/ST 200 μm PCS fiber.

Not included in the evaluation kit are:

- 5.0 V DC power supply and power supply cables
- Digital multimeter
- Pattern generator
- Serial data analyzer (oscilloscope)
- Opto/Electrical converter

4. Evaluation PCB description

The evaluation board schematic is shown in Figure 2. The transmitter and the receiver are DC coupled and TTL compatible. The top and bottom sides of the PCB are shown in Figure 3a and 3b, respectively.

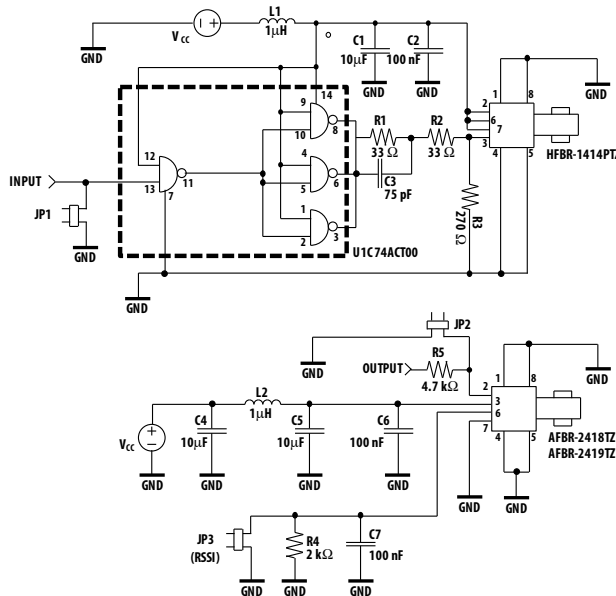


Figure 2. Schematic of the evaluation board. The transmitter is shown on the top, while the receiver is shown on the bottom

The evaluation board is a two-layer PCB designed for up to 50 Mbit/s. The transceiver lines are placed below the ground plane (top side) to ensure a low inductance signal return path and continuous impedance along the trace. The ground plane under/around the transceiver helps dissipate thermal energy. For best transceiver performance, the decoupling capacitor and ferrite bead should be placed as close as possible to the transceiver supply voltage.

Table 1 describes the input/output interface. The input/output interface is shown on the top side of the evaluation board.

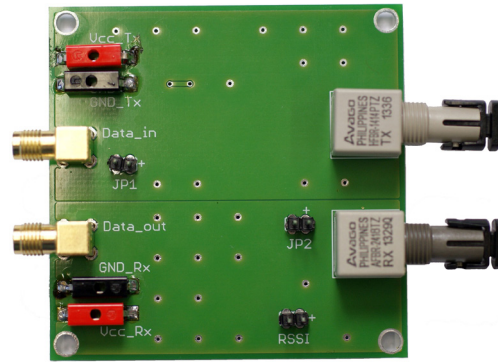


Figure 3a. Top side of evaluation board

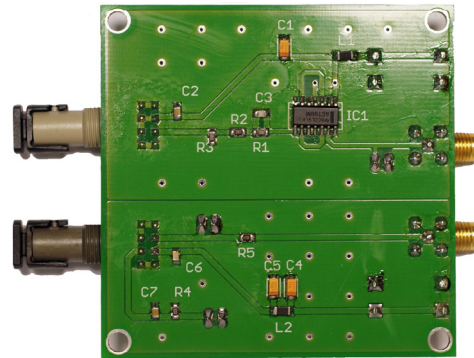


Figure 3b. Bottom side of evaluation board

Table 1. Input/output description

Name	Description	Signal level
Data_in	Transmitter input	TTL
Data_out	Receiver output	TTL
JP1	Input signal to the transmitter section	TTL
JP2	Output signal generated by AFBR-2418TZ/AFBR-2419TZ	TTL
RSSI	RSSI-equivalent voltage	Up to $V_{CC}-1$
Vcc_Tx / Vcc_Rx	Transmitter and receiver power supply	5.0 V
GND_Tx / GND_Rx	Transmitter and receiver ground	GND

5. Electro-Optical test configurations

The basic test configuration for evaluating the HFBR-1414PTZ module is shown in Figure 4 (transmitter). The transmitter module can be characterized for electrical features such as eye diagram, rise and fall time, jitter, and current consumption. Also, the launched optical power (LOP) can be measured. Low loss RF cables should be used to connect the input and output signals to the test equipment.

The AFBR-2418TZ/AFBR-2419TZ modules can be evaluated as well. In this case, the basic test configuration is shown in Figure 5 (receiver). The receiver module can also be characterized for all the aforementioned parameters, except for launched optical power (LOP).

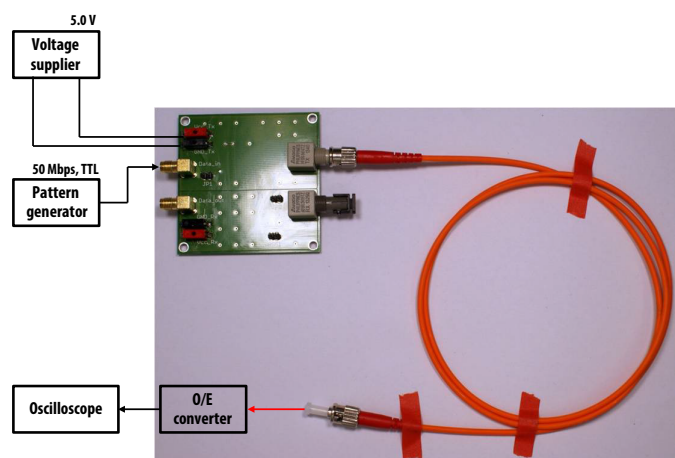


Figure 4. HFBR-1414PTZ measurement setup configuration (transmitter)

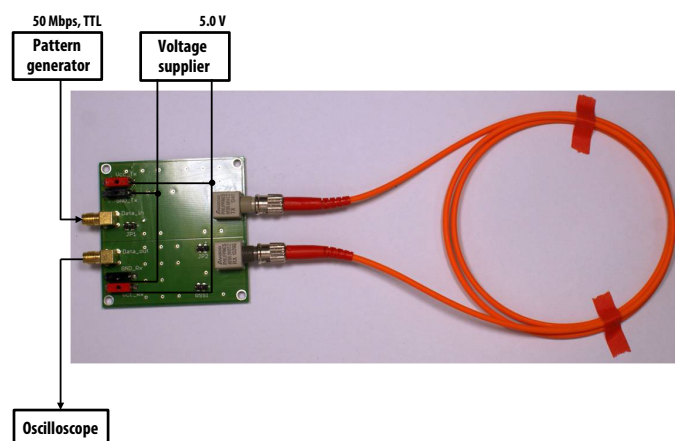


Figure 5. AFBR-2418TZ/AFBR-2419TZ measurement setup configuration (receiver)

Transmitter measurement configuration

Figure 4 shows the transmitter measurement configuration. The 62.5 μm multimode cable shown in the figure is included in the evaluation kit as well as a 200 μm PCS cable. The transmitter characteristics that can be tested are: current consumption, LOP, rise and fall time, and jitter performance, including the eye diagram measurement. In this configuration, the receiver section is not used.

Receiver measurement configuration

Figure 5 shows the receiver measurement configuration. The 62.5 μm multimode cable shown in the figure is provided with the evaluation kit as well as a 200 μm PCS cable. These cables are used to obtain a transmission link between the transmitter and the receiver. The receiver characteristics that can be tested are: current consumption, rise and fall time, and jitter performance, including an eye diagram measurement.

Results

The measurements are carried out using the configurations shown in Figure 4 and Figure 5. The pattern generator is set to a PRBS 2^7-1 pattern and a data rate of 50 Mbit/s, with a TTL-compatible signal. The transmitter LOP, measured with an optical power meter (OPM) at 820 nm, was -15.6 dBm for the 62.5 μm multimode cable and -7.4 dBm for the 200 μm PCS cable, with a current consumption of 43.0 mA, at 5.0 V supply voltage and for a temperature of 25 $^{\circ}\text{C}$.

When testing the receiver, the current consumed by the transmitter is also considered. In the case of the fiber optic receiver AFBR-2418TZ, the overall current consumption is 62.8 mA, for a supply voltage of 5.0 V. On the other hand, when the fiber optic receiver is AFBR-2419TZ, the overall current consumption is 54.0 mA, for a supply voltage of 5.0 V.

Figure 6 shows the transmitter eye diagram after the optical-to-electrical converter block.

Figure 7a shows the eye diagram for AFBR-2418TZ, measured through the SMA Data_out connector, as shown in Figure 5. Figure 7b shows the eye diagram for AFBR-2419TZ, measured through the SMA Data_out connector as well.

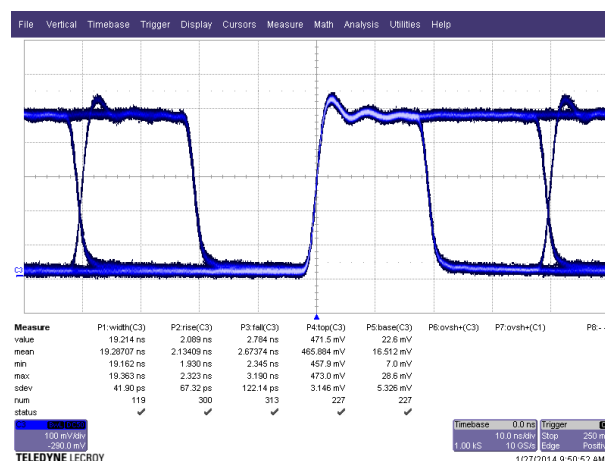


Figure 6. HFBR-1414PTZ eye diagram

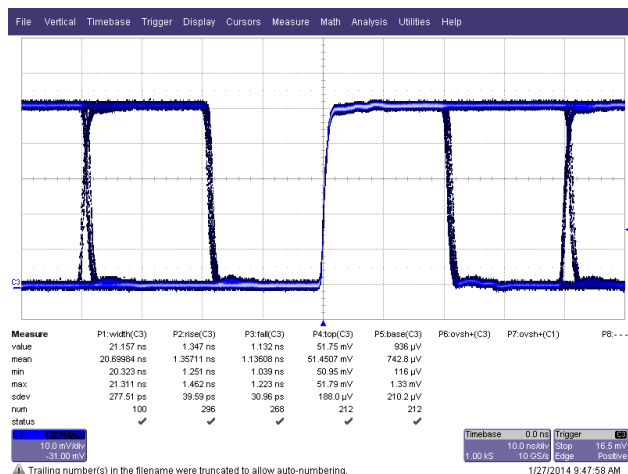


Figure 7a. AFBR-2418TZ eye diagram

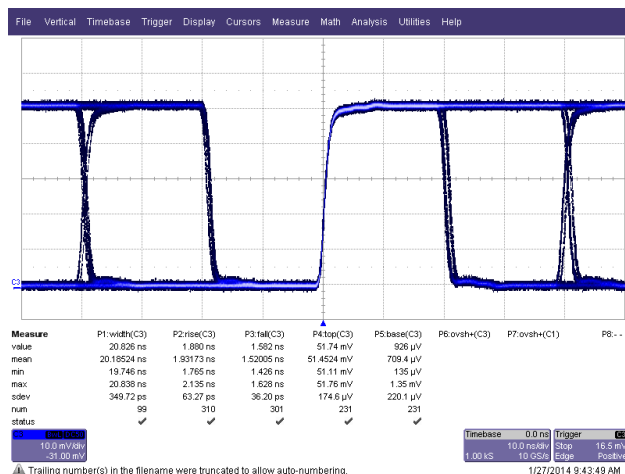


Figure 7b. AFBR-2419TZ eye diagram

6. Evaluation board schematic and bill of materials (BOM)

The evaluation board electrical schematic is shown in Figure 2. The bill of materials (BOM) is given in Table 2.

Table 2. Bill of materials

Component	Type	Value	Footprint	Comments
5V Tx, 5V Rx	Jack, 2 mm			Farnell, part no. 497150
GND Tx, GND Rx	Jack, 2 mm			Farnell, part no. 497162
JP1, JP2, JP3	Pin header		1X02	
Input, Output	ST-SMB			Farnell, part no. 1608609
R1, R2	SMD resistor	33 Ω	R0805	
R3	SMD resistor	270 Ω	R0805	
R4	SMD resistor	2 K Ω	R0805	
R5	SMD resistor	4.7 K Ω	R0805	
C1, C4, C5	SMD capacitor	10 μ F		Farnell, part no. 1135234
C2, C6, C7	SMD capacitor	100 nF	C0805	
C3	SMD capacitor	75 pF	C0805	
L1, L2	SMD Ferrite bead	1 μ H	L1206	
U1C 74ACT00	SMD Quad 2-input NAND gate		Datasheet 74ACT00	Farnell, part no. 1103083
AFBR-1414PTZ	Module		Datasheet AFBR-1414PTZ	Farnell, part no. 2393431
AFBR-2418TZ			Datasheet AFBR-2418TZ	Farnell, part no. 2393421
AFBR-2419TZ			Datasheet AFBR-2419TZ	Farnell, part no. 2393425

For product information and a complete list of distributors, please go to our web site: www.avagotech.com

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