Application Note

AFBR-FSEK50B00S

SMA Evaluation Kit for the AFBR-FS50B00 Optical Wireless Transceiver

Overview

This application note introduces the Broadcom® AFBR-FSEK50B00S evaluation kit, which is to be used as an evaluation platform for the AFBR-FS50B00 optical wireless transceiver. This document describes the two boards in the evaluation kit and includes a simple test setup to check whether the kit works correctly prior to testing any user application.

Evaluation Kit

The evaluation kit includes:

- Two PCBs with SMA connectors and AFBR-FS50B00 optical wireless transceiver
- Two jumpers

The evaluation kit does not include:

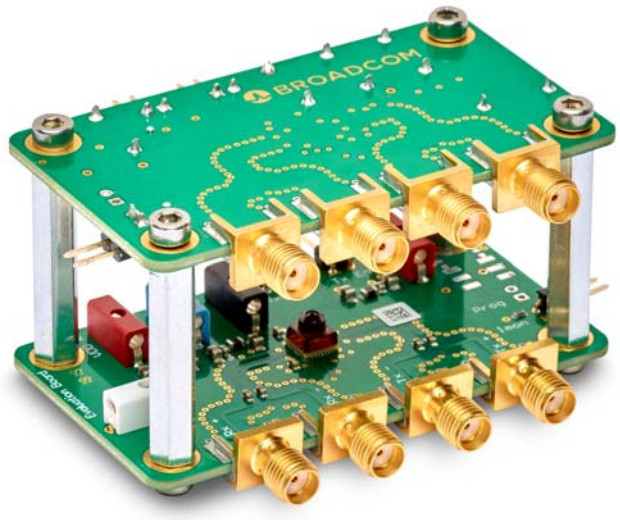
- Coaxial cables required for communication through the AFBR-FS50B00 optical wireless transceiver
- Cables required to supply power to the boards included in the evaluation kit

Introduction

The AFBR-FSEK50B00S evaluation kit, described in this application note, provides the system designer a convenient means to evaluate the performance of the AFBR-FS50B00 optical wireless transceiver.

Figure 1 shows the AFBR-FSEK50B00S evaluation kit.

Figure 1: AFBR-FSEK50B00S Evaluation Kit



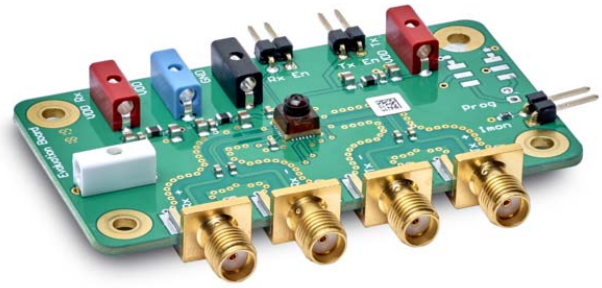
PCB Description

The AFBR-FSEK50B00S evaluation kit consists of two identical boards, facing each other, as shown in Figure 1.

There are four 30-mm metal spacers placed between the two boards, which results in a distance between the two AFBR-FS50B00 optical wireless transceivers of 20 mm (top of the lens to top of the lens).

Figure 2 shows one of the two boards of the evaluation kit.

Figure 2: One of the Two Boards of the Evaluation Kit



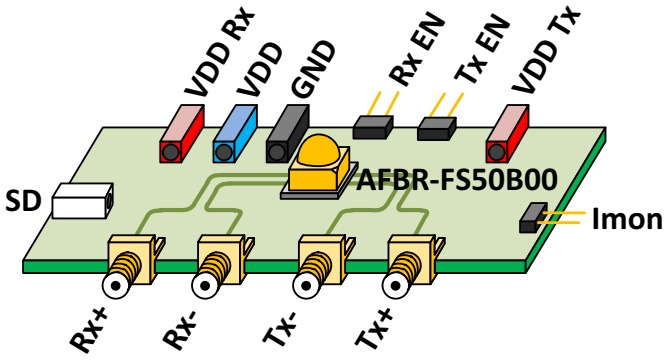
The PCB's main element is the AFBR-FS50B00 optical wireless transceiver, which is the device under evaluation.

This transceiver allows full-duplex data communication in the range 25 Mb/s to 5 Gb/s.

The following are the other relevant components available on the PCB. Figure 3 shows the location on the board of the listed components as well as the AFBR-FS50B00 optical wireless transceiver.

- The Tx+/Tx- SMA connectors supply the data signal to the transmitter.
- The Rx+/Rx- SMA connectors read the data signal from the receiver.
- The VDD Tx mini-banana connector supplies voltage to the transmitter of the AFBR-FS50B00 optical wireless transceiver. A voltage of 3.3V must be supplied to this connector.
- The VDD Rx mini-banana connector supplies the main voltage to the receiver of the AFBR-FS50B00 optical wireless transceiver. A voltage of 3.3V must be supplied to this connector.
- The VDD mini-banana connector is not used.
- The GND mini-banana connector sets the GND reference level. There is a common GND plane for all the components on the PCB.
- The SD mini-banana connector reads the signal detect (SD) output of the AFBR-FS50B00 optical wireless transceiver. When the receiver detects an incoming optical signal, a high level will be available at this connector.
- The Imon 2-pin connector reads the monitor current (Imon) output of the AFBR-FS50B00 optical wireless transceiver. This current is converted into voltage by means of a 1-kΩ resistor available on the PCB.
- The Tx En 2-pin connector must be closed with a jumper so that the driver of the transmitter is enabled.
- The Rx En 2-pin connector must be closed with a jumper as well.

Figure 3: Connector Description of One of the Boards of the Evaluation Kit



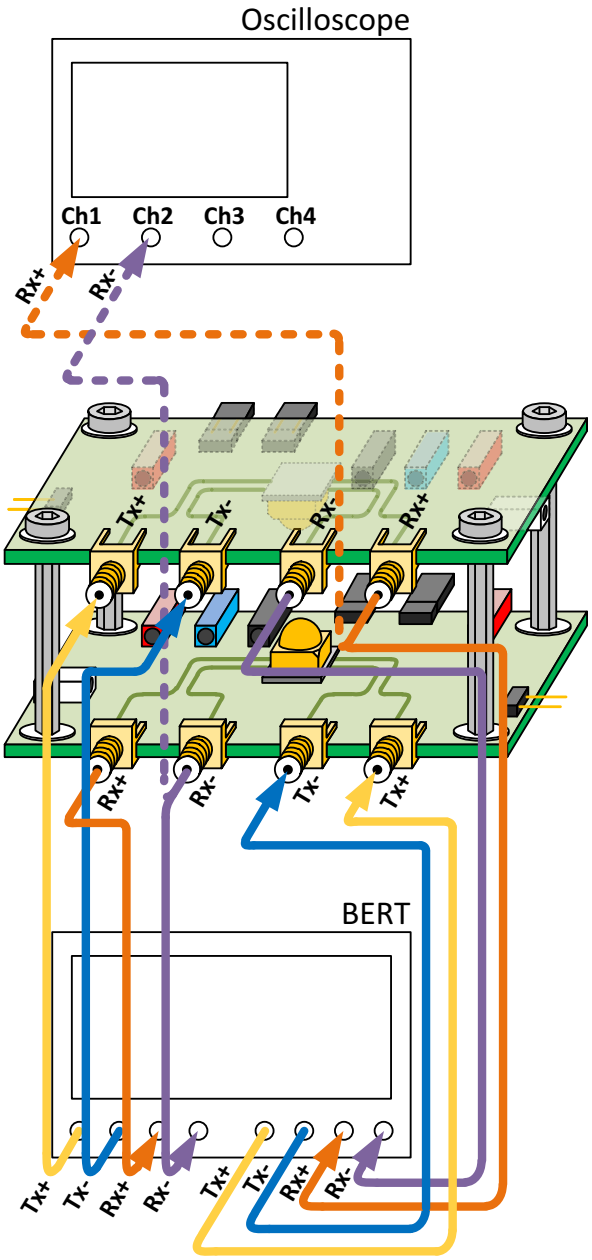
Test Setup

Figure 4 shows the test setup used to perform the three tests explained in this section.

All the tests have been executed at 25°C. The data pattern has been set to PRBS7. The BER has been evaluated in a time window of at least 3 minutes.

The current consumption specified for each test applies to the complete evaluation kit, that is, two AFBR-FS50B00 optical wireless transceivers, or, in other words, two transmitters plus two receivers.

Figure 4: Diagram of the Connection between the Evaluation Kit and the Test Equipment



NOTE: For simplicity reasons, Figure 4 does not include the wires for Vcc and GND and the voltage sources. There are the jumpers closing the Tx EN 2-pin connector as well as the Rx EN 2-pin connector (Figure 3 shows the location on the boards of the all of these elements).

The four Rx SMA cables of the test setup may be connected between the evaluation kit and the bit error rate tester (BERT). Alternatively, one Rx SMA cable coming from each PCB may be connected to an oscilloscope (see dashed lines in Figure 4), which would enable monitoring of the signal generated by the receiver of the AFBR-FS50B00 optical wireless transceiver to test the quality of the optical link.

Test 1 – Full Duplex Communication at 5 Gb/s

When the evaluation kit is connected to the test equipment as shown in Figure 4, both channels of the BERT are configured as follows:

- Data rate: 5 Gb/s
- Vpp: 0.5V

Figure 5 shows the eye diagram of the receiver of one of the AFBR-FS50B00 optical wireless transceivers for communication at 5 Gb/s.

Figure 5: Eye Diagram of the Receiver for Full Duplex Communication at 5 Gb/s

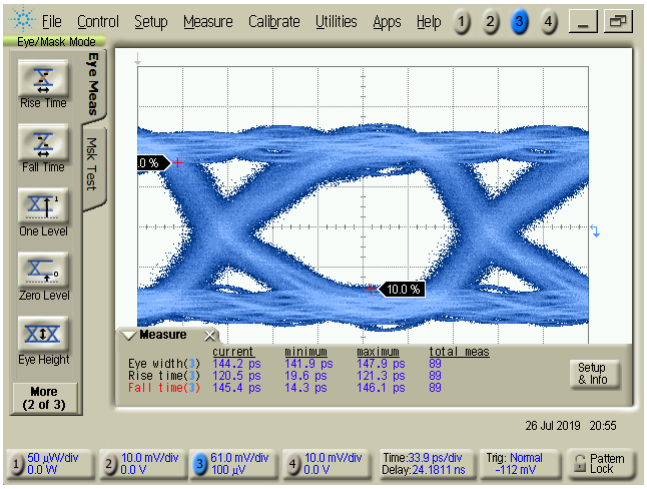


Figure 6 shows the front panel of the BERT. In this case, both communication channels are error-free (error count, EC = 0) for full duplex communication at 5 Gb/s.

Figure 6: Front Panel of the BERT for Full Duplex Communication at 5 Gb/s

The current consumption of the evaluation kit in this configuration is approximately 45 mA.

Test 2 – Full Duplex Communication at 1 Gb/s

When the evaluation kit is connected to the test equipment as shown in Figure 4, both channels of the BERT are configured as follows:

- Data rate: 1 Gb/s
- Vpp: 0.5V

Figure 7 shows the eye diagram of the receiver of one of the AFBR-FS50B00 optical wireless transceivers for communication at 1 Gb/s.

Figure 7: Eye Diagram of the Receiver for Full Duplex Communication at 1 Gb/s

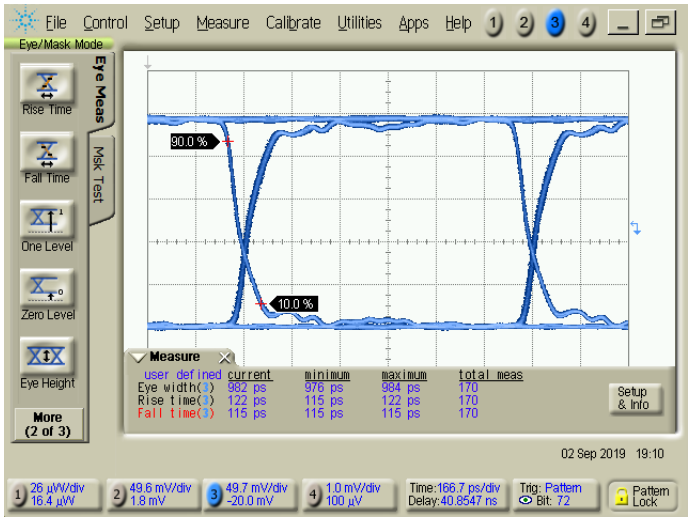


Figure 8 shows the front panel of the BERT. In this case, both communication channels are error-free (error count, EC = 0) for full duplex communication at 1 Gb/s.

Figure 8: Front Panel of the BERT for Full Duplex Communication at 1 Gb/s

The current consumption of the evaluation kit in this configuration is approximately 40 mA.

Test 3 – Full Duplex Communication at 25 Mb/s

When the evaluation kit is connected to the test equipment as shown in Figure 4, both channels of the BERT are configured as follows:

- Data rate: 25 Mb/s
- Vpp: 0.5V

Figure 9 shows the eye diagram of the receiver of one of the AFBR-FS50B00 optical wireless transceivers for communication at 25 Mb/s.

Figure 9: Eye Diagram of the Receiver for Full Duplex Communication at 25 Mb/s

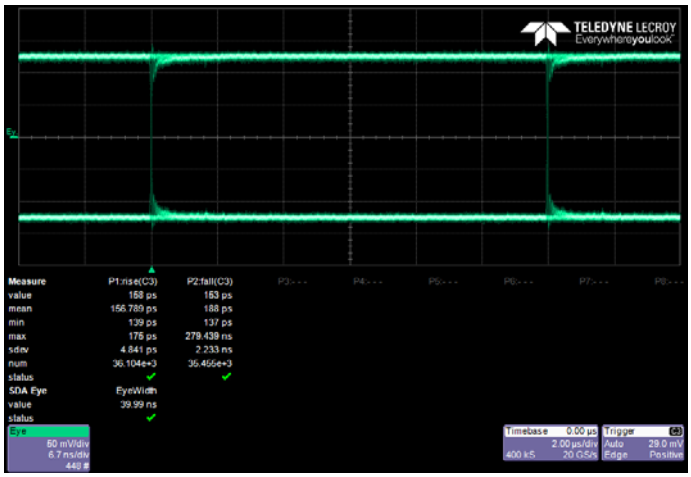
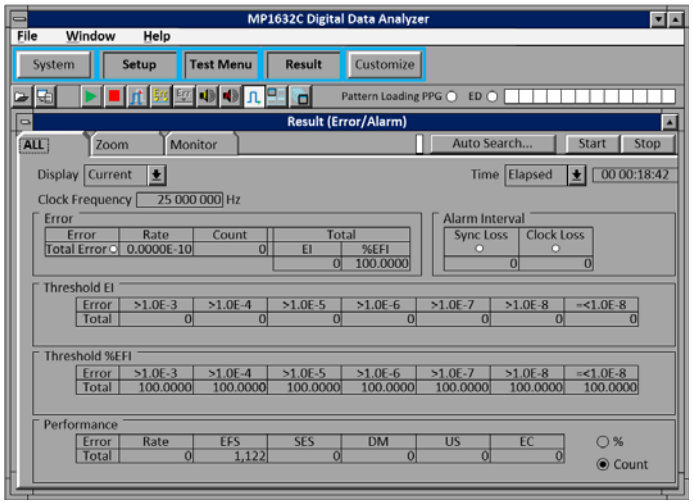


Figure 10 shows the front panel of the BERT. In this case, both communication channels are error-free (error count, EC = 0) for full duplex communication at 25 Mb/s.

Figure 10: Front Panel of the BERT for Full Duplex Communication at 25 Mb/s



The current consumption of the evaluation kit in this configuration is approximately 48 mA.

For the three tests described previously, the readouts of the signal detect (SD) and Imon (measured over a 10-kΩ resistor) are 1.4V and 20 mV, respectively.

Figure 11: PCB Schematic