

Bluetooth® Certification Guidelines for EZAIRO® 7150 SL-Based Products

Introduction

In order to sell a Bluetooth-enabled device, there is a need for compliance and certification. The Bluetooth Compatibility Program complies with the requirements of Bluetooth license agreements and ensures a seamless user experience through the vast number of Bluetooth mobile devices that are available in the market.

This application note details the fundamental process of releasing a Bluetooth Low Energy product based on the Ezairo 7150 SL hybrid.

Once a product based on Ezairo 7150 SL is complete and be ready for release to market, the product must be qualified. If the hearing aid product strictly follows the Ezairo 7150 SL reference design (including circuits, matching networks, antenna design, layout, and profiles), it is not necessary to go through the complete qualification process. The Nordic Semiconductor nRF51822 Qualification Design Identification (QDID) can be referred to when a new end product listing is created.

On 1 February 2014, the Bluetooth Special Interest Group (SIG) introduced a new qualification and listing process and fee structure for all new product listings. Detailed information can be found at:

<https://www.bluetooth.org/en-us/test-qualification/qualification-overview/listing-process-updates>.

Qualification Process

1. Become a Bluetooth SIG member and purchase a Declaration ID.

Detailed information can be found on the Bluetooth SIG website

(<https://www.bluetooth.org/en-us/test-qualification/qualification-overview>).

2. Prepare product information and submit to a Bluetooth Qualification Test Facility (BQFT). The BQFT will estimate the qualification test and procedure costs.

The following information will need to be prepared and submitted to a BQTF:

- ◆ Core specification of the product
NOTE: For products based on Ezairo 7150 SL, this is 4.1.
- ◆ Product type (End product, subsystem, or component)
NOTE: For products based on Ezairo 7150 SL, this is “end product”.



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APPLICATION NOTE

- ◆ Profiles supported
NOTE: For hearing aids, this is optional. Please check all the profiles that will be supported when product is released in the Qualified Design Listing (QDL) information sheet. ON Semiconductor did not list the profile and did not complete profile testing.
- ◆ Brand, model, and QDID of the product’s Bluetooth SoC

NOTE: For products based on Ezairo 7150 SL, the SoCs used are the Ezairo 7150 SL from ON Semiconductor and the nRF51822 radio IC from Nordic Semiconductor. The QDID for nRF51822 is 62792. The declaration ID for Ezairo 7150 SL is D028476.

The BQFT will estimate the qualification test cost based on the information above and provide a quotation for testing. A list of all BQTFs can be obtained through the Bluetooth SIG. A Bluetooth Qualification Expert (BQE) from an authorized testing house can provide advice during the qualification test.

NOTE: ON Semiconductor used AT4Wireless for Bluetooth qualification and certification tests, including FCC, IC and CE.

3. Provide product samples to a BQTF for testing
Several product samples are required to be submitted for testing, including:
 - ◆ Product sample for RF testing
These samples must be ready for conducted RF tests, so the product vendor will need to disconnect the antenna and use a 50 Ω SMA connector for the connection to test equipment. The product vendor will also need to provide instructions for entering Test Mode and for the Bluetooth Low Energy RF PHY test. These test samples will need an available UART interface.
 - ◆ Product sample for profile test (optional for hearing aids)
If any adoptable profiles will be listed in QDL, a final product must be submitted for this test. Custom

profiles do not require testing.

NOTE: ON Semiconductor has not listed any adoptable profile, so this test was not completed.

NOTE: You will need to provide a power supply connection for all samples, as a battery cannot support the current consumption in Test Mode for the duration of the test.

4. Create a new product listing. You will need to sign a Declaration of Compliance (DoC). Once the qualification process is done, your device is officially Bluetooth compliant. You may display the Bluetooth logo on your product.

Putting the nRF51822 Radio IC into Test Mode

In order to put the radio IC into Test Mode, you will need to flash the Test Mode firmware onto the Ezairo 7150 SL hybrid. For detailed instructions, refer to Section 4.3 Downloading Firmware to the Radio on the BTE Hearing Aid in the Ezairo 7150 SL BTE Hearing Aid Reference Design User Manual.

NOTE: You will need to flash the device with the Hybrid_DTM.hex provided instead of the firmware file (Ezairo7150SL_HearingAid_Sample.hex file) described in the Flashing the Radio Firmware section.

Emulating a UART Interface

In the Ezairo 7150 SL BTE reference design, the UART interface of Ezairo 7150 SL is not exposed, so you will need

to use two DIO ports to pass through the UART interface. Ezairo 7150 SL sample code for the UART pass-through is provided in the Ezairo_7150_SL_UART_samplcode.zip file. Open the zip file in the Integrated Development Environment (IDE) provided in the Ezairo 7100 Evaluation and Development Kit (EDK).

In the default setting in *app.cfi*, **DIO6** and **DIO8** are set as **UART**:

```
// UART pins between the PC and the E7100
#define DIO_UART_PC_RX           6
#define DIO_UART_PC_TX           8
```

In this configuration, you can change to the other DIO. You will need to solder two wires onto the two DIO pads, and connect to a level shifter since our logic level is 2 V, which is not compatible with RS232 level. This set-up is shown in Figure 1.

Putting the Ezairo 7150 SL-based Product into Test Mode:

1. Program nRF51822 with Hybrid_DTM.hex using the DFU.
2. Configure the DIO for UART interface pass through as described.
3. Connect the DUT, level shifter, RS232 USB adapter, and BLE test equipment as shown in Figure 1.
4. Configure the BLE test equipment, making sure the UART baud rate is 19200 kbps.

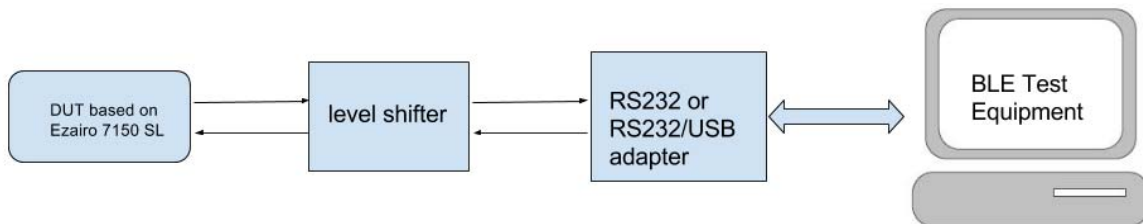


Figure 1. Connection Diagram for Bluetooth Test

Certification Process

A Bluetooth product contains a wireless radio working at 2.4 GHz ISM band. In order to sell in different countries and regions, some certification tests must be passed.

Here is a list of certification tests required in specific countries or regions:

- United States of America (FCC)
- Canada (IC)
- Europe (CE)
- China (SRRC)
- Korea (KCC)
- Japan (JRF TELEC)

For detailed information on certification testing required in your country or region, please contact an authorized testing facility.

The Ezairo 7150 SL daughtercard design has passed FCC certification and CE certification testing at AT4 Wireless lab. During the certification and emission test, ON Semiconductor used an off-the-shelf SMA antenna, ANT-2.4-CW-RAH-SMA-ND from Linx Technologies, which has 1.6 dBi peak gain. The differential antenna used in our BTE reference design has approximately -11.5 dBi peak gain. Therefore, the emission and spurs level from an Ezairo 7150 SL-based BTE hearing aid will be about 10dB lower than the level from the Ezairo 7150SL daughtercard design. This antenna gain change will make the certification test easier for a BTE product.

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Further Reading


Bluetooth qualification and certification test reports for the Ezairo 7150 SL BTE hearing aid reference design are available on request as reference. Please contact your account manager or sales representative for more information.

For more information on the reference design, please refer to the following documents included in the Ezairo 7150 SL Reference Design Hardware Package:

- Ezairo 7150 SL BTE Hearing Aid Reference Design User Manual
- Ezairo 7150 SL Remote Microphone Reference Design User Manual
- Ezairo 7150 SL Hybrid Demonstrator Board User's Guide

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