CC2541 Mini Development Kit Quick Start Guide

User's Guide

Literature Number: SWRU332C
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CC2541 Mini Development Kit Quick Start Guide

1 Opening the Box and Evaluating Bluetooth® Low Energy

1.1 Kit Contents

- 1 × CC2540 USB dongle
- 1 × CC2541 Keyfob board
- 1 × Keyfob plastic case
- 1 × CC Debugger with cables
- 1 × CR2032 Battery
- Documentation

The RF boards in this kit are designed to comply with ETIS, FCC, and IC regulations over a temperature from 0°C to +35°C. The kit is for evaluation only; it is not FCC approved for resale.

CAUTION

The kit contains ESD sensitive components. Handle with care to prevent permanent damage.

1.2 Introduction

This document is a guide through the initial steps required to run the preprogrammed Bluetooth® low energy (BLE) Keyfob demo application.

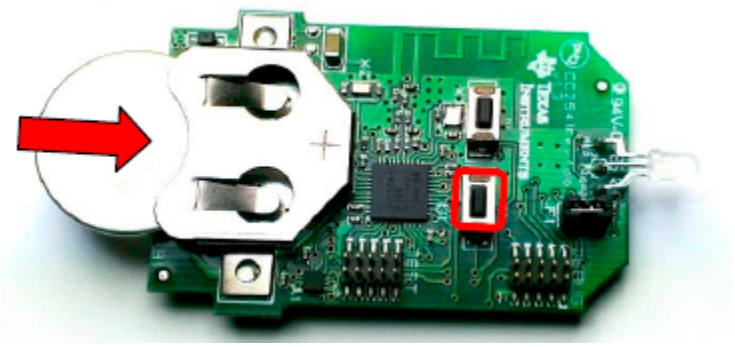
This guide describes the hardware in the box and some of the tools that can be used for developing software at a later stage. For the CC2541DK-MINI, there are two ways of getting started:

1. Evaluate using BTool: BTool is a Windows® application that allows the user to control a central device using the serial interface, and perform various BLE functions while connected to a peripheral device, such as the CC2541 Keyfob.
2. Evaluate using an iOS™ device: Some Apple iOS devices support BT4.0, and Texas Instruments has created an iOS application to evaluate a peripheral device, such as the CC2541 Keyfob. The iOS application runs on:
   - iPhone 4s / 5 / 5s / 5c / 6 / 6Plus / 6s
   - iPad 3 / 4 / air / air 2
   - iPod Touch (5. gen)

1.3 Hardware Setup

First, power up the CC2541 Keyfob. Insert the CR 2032 battery, as shown in Figure 1; the LED is lit green for one second.

Figure 1. Insert Battery



Toggle advertisements on and off by pushing the right button on the CC2541 Keyfob. During advertisement, the LED blinks red.

WARNING

This kit includes a non-rechargeable lithium battery. To minimize risk of personal injury or property damage due to a potential explosion or rupture of the battery, always completely remove the battery from the CC2541 Keyfob when connected to an external power source. The external power source cannot exceed 3.6 VDC. Dispose of the battery properly, and keep out of the reach of children at all times.

2 Evaluate Using BTool

2.1 Download and Install BLE-Stack

The latest BLE software can be downloaded at www.ti.com/ble-stack.

After the BLE-Stack software installation is complete, the USB dongle driver must be associated with the device to use the BTool application. To associate the USB dongle driver, first connect the USB dongle to the USB port of the PC, or to a USB hub that connects to the PC.

The first time the dongle is connected to the PC, a message pops up indicating that Windows does not recognize the device.

The driver is found in the Accessories\ Drivers folder in the default install directory. For more information on how to install the driver, refer to the *CC2540/41 Mini Development Kit User Guide* (SWRU270).

2.2 Identify the COM Port Number

When the driver is installed, determine which COM port Windows has assigned to the USB dongle. Right-click on Computer in the Start Menu, and select Properties.

The System Properties window opens; select Device Manager.

A list of all hardware devices appears. Under the Ports (COM & LPT) section, the device TI CC2540 Low-Power RF to USB CDC Serial Port appears. Next to the name should be the port number (COM#).

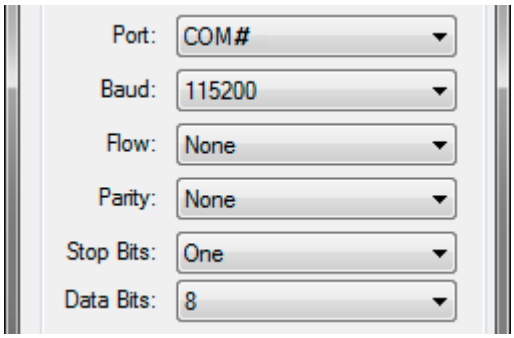
Note this port number, as it is needed to use BTool.

2.3 Start BTool

BTool is included as part of the installation of the BLE stack, and can be found in the \Projects\BTool folder in the default install directory.

When starting up BTool, you will be prompted to set port settings. Select the options shown in Figure 2, and press OK.

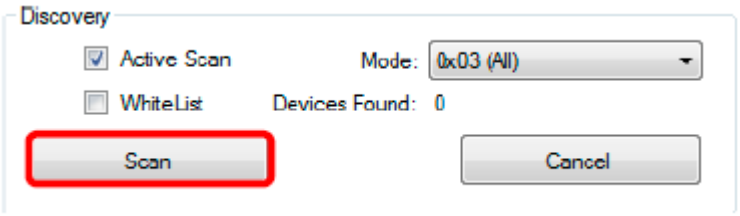
Figure 2. Port Settings



2.4 Connect to the CC2541 Keyfob

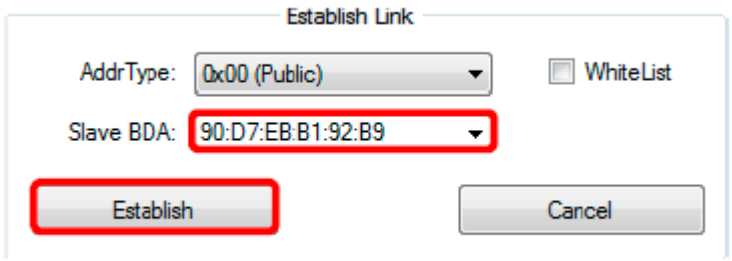
Pressing the right button on the CC2541 Keyfob starts the advertisement. The device advertises for 30 seconds. In BTool, press the Scan button, as shown in Figure 3.

Figure 3. Scan Button



After the scanning is complete, choose the device to connect to, and press Establish, as shown in Figure 4.

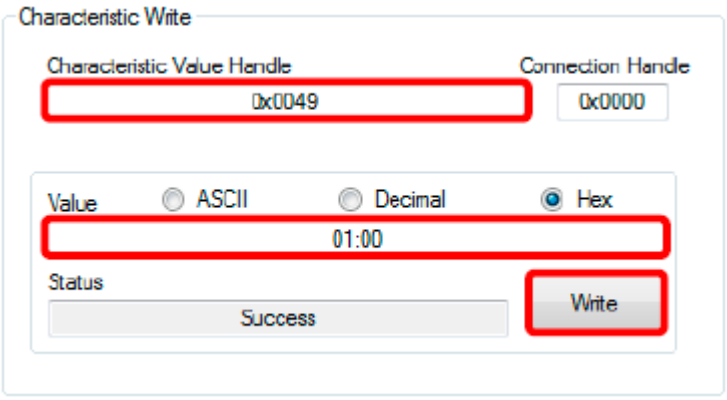
Figure 4. Establish Button



2.5 Button Notifications

To notify when buttons are pressed on the CC2541 Keyfob, notifications must be enabled. This is done in the Read/Write tab of BTool by writing 01:00 to the characteristic handle 0x0049, as shown in Figure 5.

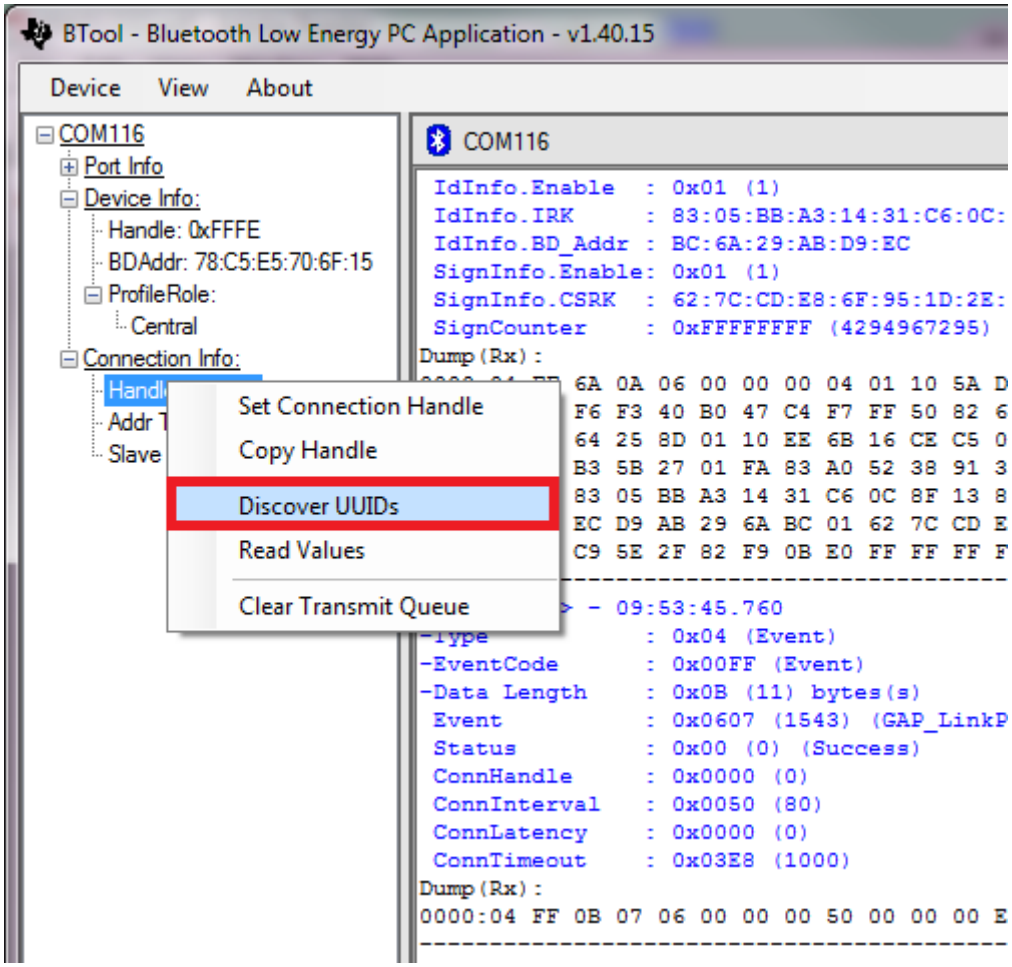
Figure 5. Characteristic Value Handle



If a button on the CC2541 Keyfob is now pushed, notifications are sent, and can be monitored in the BTool log window.

NOTE: These handles are subject to change, depending on the firmware version used. To verify handle IDs, discover all UUIDs by right-clicking the handle id under Connection Info, and selecting Discover UUIDs, as shown in Figure 6.

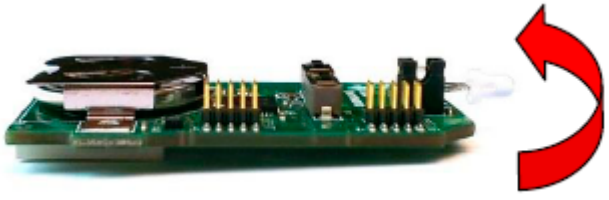
Figure 6. Discover UUIDs



2.6 Enable Accelerometer

Similar to the button notifications, the notifications for the accelerometer data can be enabled. This example only shows enable notifications for the x-axis.

First, enable the accelerometer by writing 01:00 to the characteristic handle 0x0035 in the Read/Write tab of BTool. To enable notifications for the xaxis, write 01:00 to the characteristic handle 0x003C. This enables the CC2541 Keyfob to send notifications as it is moved.



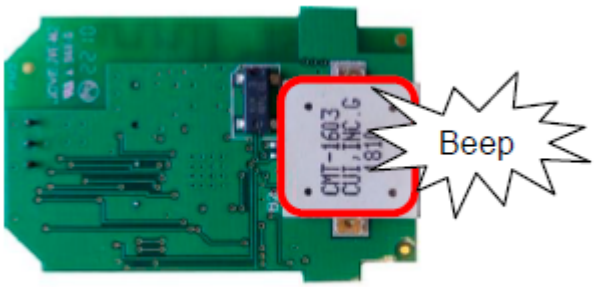
For more information about the accelerometer service, refer to the *CC2540/41 Mini Development Kit User Guide* (SWRU270).

2.7 Immediate Alert

To sound the buzzer located on the CC2541 Keyfob, write the following value to the characteristic handle 0x0028:

- 01:00 for low Alert
- 02:00 for high Alert
- 00:00 to turn off

The buzzer will sound for 10 seconds.

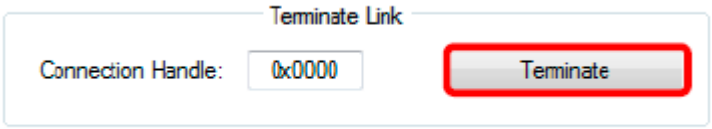


2.8 Terminate Connection

There are three options to terminate the connection:

- Press the Terminate button in BTool, as shown in Figure 7.
- Remove the battery from the CC2541 Keyfob, which triggers a supervision timeout.
- Move the CC2541 Keyfob out of range (typically >10m), which triggers a supervision timeout.

Figure 7. Terminate Button



2.9 Source Code

The project and source code files for the preprogrammed application (as well as many others) are included with the Bluetooth low energy (BLE) stack from Texas Instruments, which can be downloaded at www.ti.com/ble-stack.

The project implementing this demo is called Keyfobdemo (CC2541DK-mini Keyfob Slave configuration). The project can be modified as desired, and should provide a good framework for developing custom BLE applications.

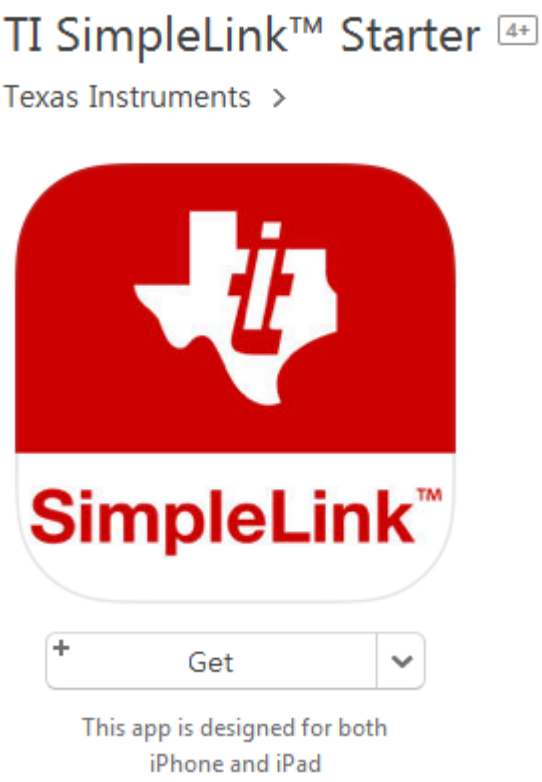
More details on these projects can be found within the *BLE Software Developer's Guide* (SWRU271), which is also included with the stack installer. For troubleshooting, refer to the *CC2540/41 Mini Development Kit User Guide* (SWRU270).

3 Evaluate Using an iOS Device (iPod, iPad, or iPhone)

3.1 Download the SimpleLink™ Starter

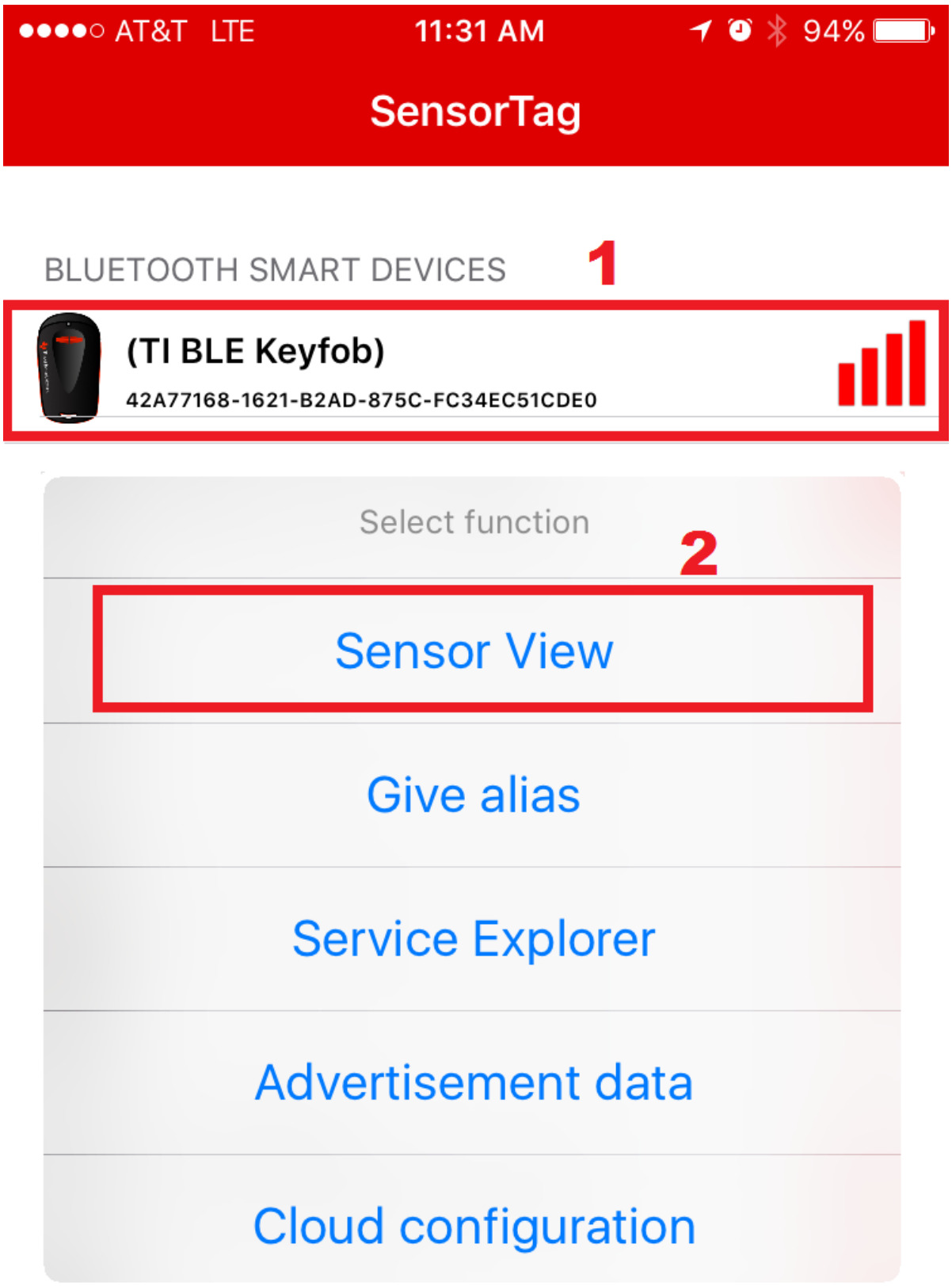
The SimpleLink™ Starter iOS app can be downloaded through iTunes (found at www.apple.com/itunes) or the App Store, which is pre-installed on iOS devices.

Figure 8. SimpleLink™ Starter



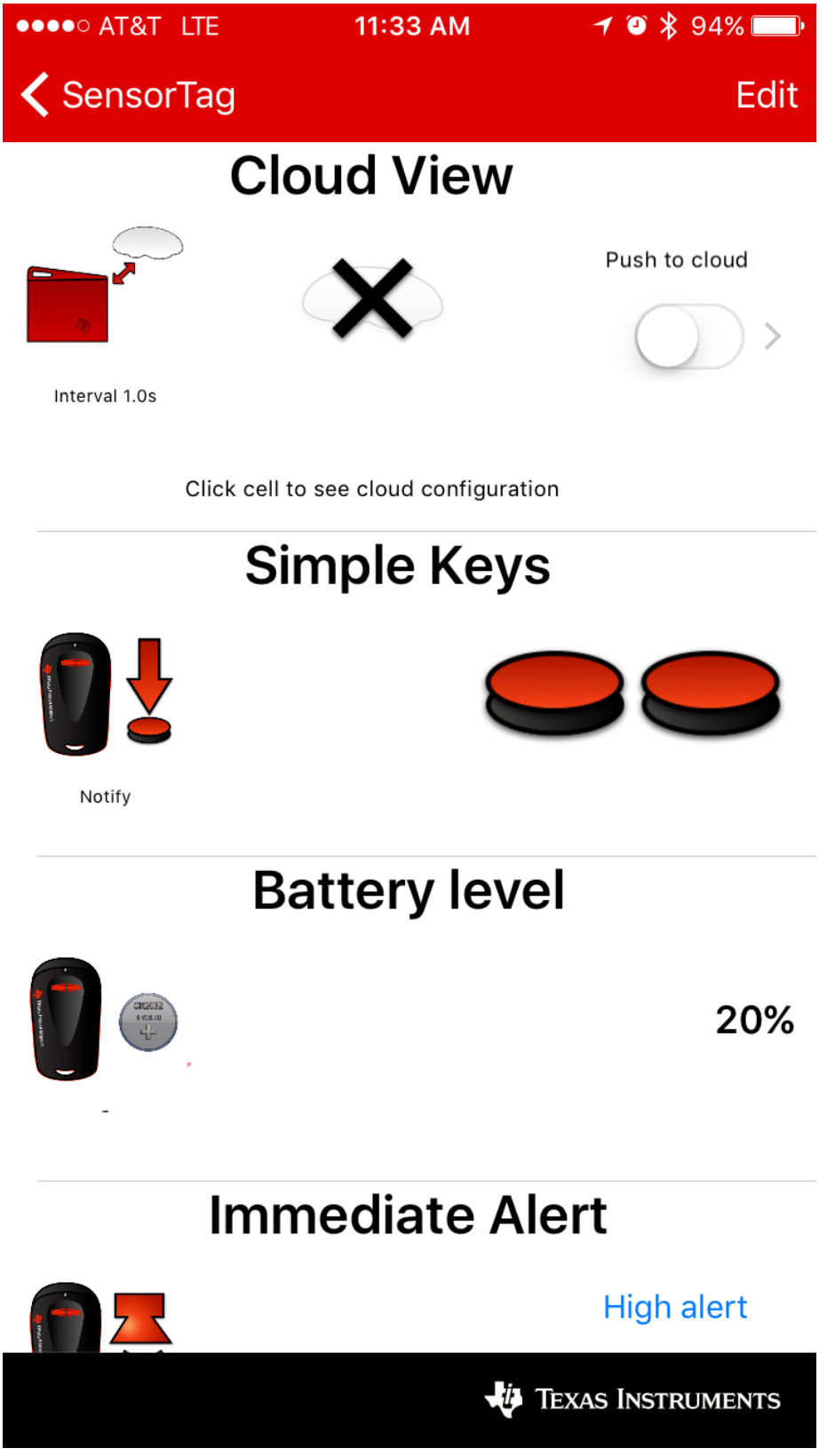
3.2 Connect to the CC2541 Keyfob

Figure 9. Connect to the Keyfob



3.3 Evaluate the Application

Figure 10. Evaluate App

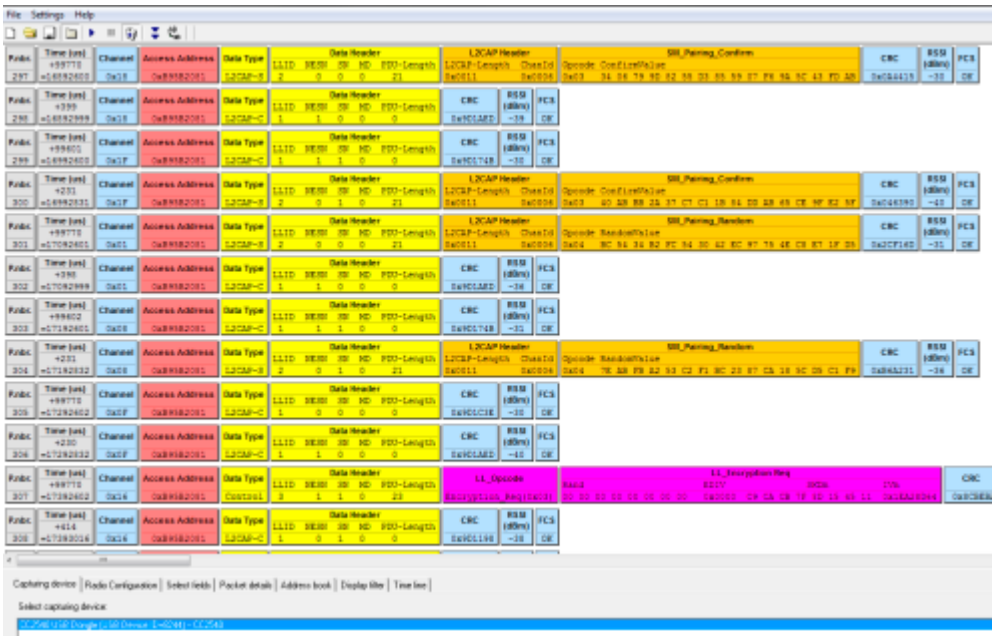


4 Additional Tools and Links

4.1 TI Packet Sniffer

The CC2540 USB dongle loaded with the TI Packet Sniffer firmware can be used as a BLE sniffer, and monitor packets while the iPhone 4S Demo is running.

Figure 11. BLE Packet Sniffer

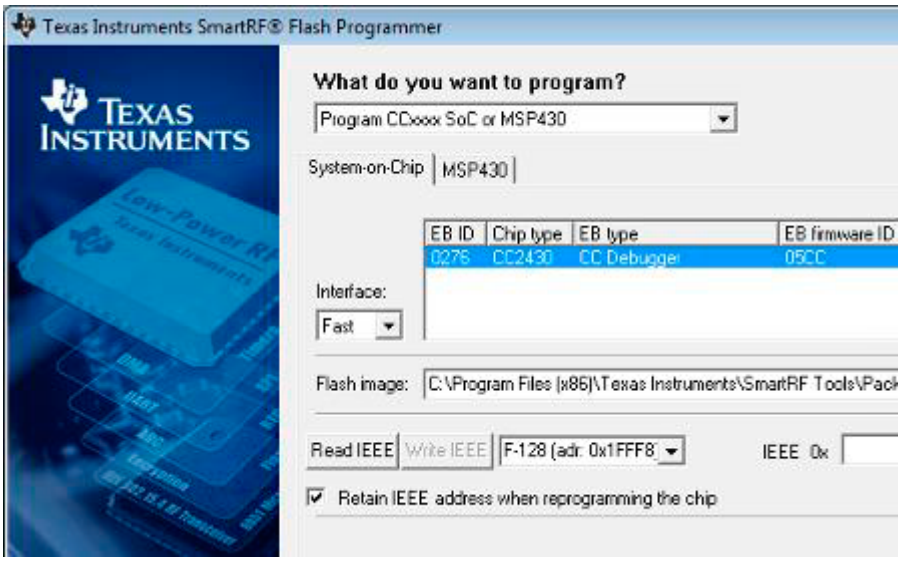


The TI Packet Sniffer software can be downloaded at www.ti.com/tool/packet-sniffer.

4.2 SmartRF Flash Programmer

Texas Instruments has a simple tool to program and flash the CC2541.

Figure 12. SmartRF Flash Programmer

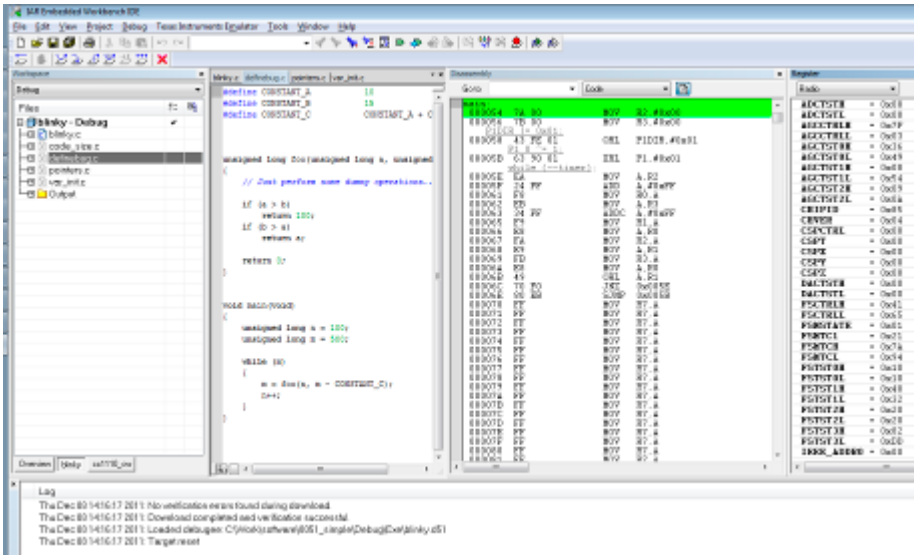


SmartRF Flash Programmer can be downloaded at www.ti.com/tool/flash-programmer.

4.3 IAR Embedded Workbench

To develop software, program, and debug the CC2541, use the IAR Embedded Workbench for 8051.

Figure 13. IAR Embedded Workbench

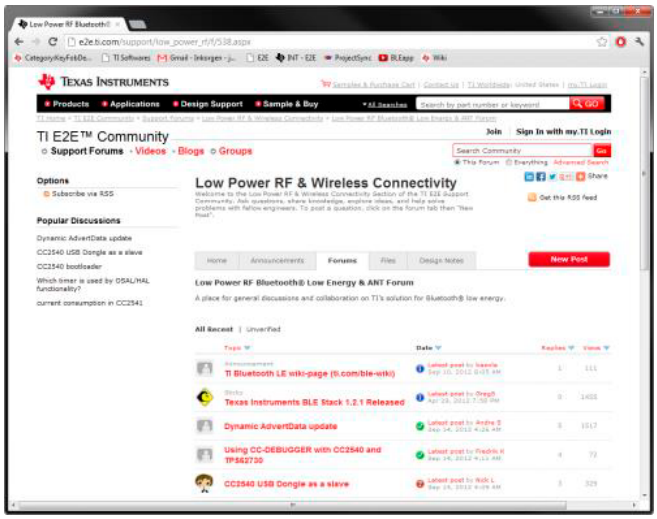


More information on IAR EW8051, including a free evaluation version download, can be found at https://www.iar.com/iar-embedded-workbench/partners/texas-instruments/ti-wireless/. Refer to the *BLE Software Developer's Guide* (SWRU271) for the specific version of IAR.

4.4 BLE E2E Forum

For additional help, visit the TI Bluetooth low energy E2E forum, www.ti.com/ble-forum, for instant support during development.

Figure 14. BLE E2E Forum



4.5 BLE Wiki

The BLE Wiki contains application examples, guides, and documentation covering any extra steps you might need help with. The Wiki is not only managed by Texas Instruments employees, but also by E2E community members. Anyone can share, edit, and make use of the information posted here.

The Wiki is found at www.ti.com/ble-wiki.

4.6 Useful Links

- TI BLE Stack and Software: www.ti.com/ble-stack
- *CC2540/41 Mini Development Kit User Guide*: www.ti.com/lit/swru270
- *CC2540/41 BLE Software Developer's Guide*: www.ti.com/lit/swru271
- *CC2540/41 User's Guide*: www.ti.com/lit/swru191
- CC2541 Product Page: www.ti.com/product/cc2541

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from B Revision (October 2015) to C Revision	Page
• Changed Characteristic Handle from 0x0048 to 0x0049.	7
• Updated Characteristic Value Handle image.	7
• Changed Characteristic Handle from 0x0034 to 0x0035.	8
• Changed Characteristic Handle from 0x003B to 0x003C.	8

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