

CC2540 Mini Development Kit Quick Start Guide

Opening the Box and Evaluating *Bluetooth*® Low Energy

Kit Contents



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

The RF Boards in this kit are FCC and IC certified and tested to comply with ETSI/R&TTE over temperature from 0 to +35°C.



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

Introduction

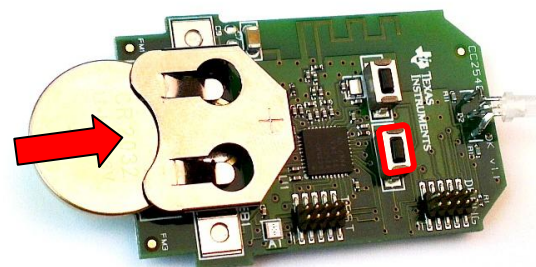
This document will guide you through the initial steps required in order to run the pre programmed *Bluetooth*® low energy demo application.

You will get familiar with the hardware in the box and some of the tools that can be used for developing your own software at a later stage. For the CC2540DK-MINI, there are two ways of getting started:

1. **Evaluate Using BTool.** BTool is a Windows application that allows you to control a central device using the serial interface and perform various BLE functions while connected to a peripheral device, such as the CC2540 Keyfob.
2. **Evaluate Using iPhone 4S/5.** Apple iPhone 4S and 5 both support BT4.0 and Texas Instruments have created an iOS Application to evaluate a peripheral device, such as the CC2540 Keyfob.

Hardware Setup

First, you will need to power up the CC2540 Keyfob. When you insert the CR 2032 battery, the LED will be lit green for one second.



You can toggle Advertisements on and off by pushing the right button on the CC2540 Keyfob. During advertisement, the LED will be blinking red.

Caution! This kit includes a non-rechargeable lithium battery. Always make sure the battery is removed from the CC2540 Keyfob when it is connected to an external power source (Do not apply voltage > 3.6V). Dispose the battery properly and keep out of the reach of children. If swallowed, contact a physician immediately.

Evaluate Using BTool

1. Download & 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 in order to use the BTool application. To associate the USB Dongle driver, you must first connect the USB Dongle to the PC's USB port, or to a USB hub that connects to the PC

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

The driver is found in the folder Accessories\Drivers in the default install directory. For more information on how to install the driver, please refer to the CC2540DK-MINI User Guide, found at...

2. Identify the COM Port Number

Once the driver is installed, you need to determine which COM port Windows has assigned to the USB Dongle. Right-click on "Computer", listed in the Start Menu, and select "Properties".

The "System Properties" window should open up, where you can select "Device Manager".

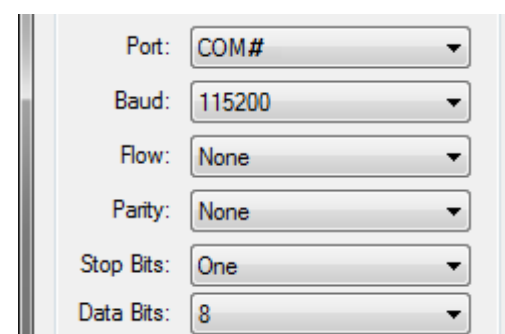
A list of all hardware devices should appear. Under the section "Ports (COM & LPT)", the device "TI CC2540 Low-Power RF to USB CDC Serial Port" should appear. Next to the name should be the port number (COM#)

Take note of this port number, as it will be needed in order to use BTool.

3. Start BTool

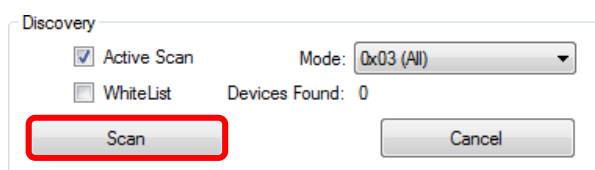
BTool is included as part of the installation of the BLE stack and can be found in the folder \Projects\BTool in the default install directory.

When you start up BTool, you will be prompted to set port settings. Select the options below and press "OK".

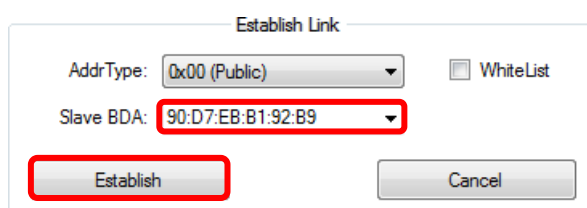


4. Connect to CC2540 Keyfob

Pressing the right button on the CC2540 Keyfob starts the advertisement. The device advertises for 30 seconds. In BTool, press SCAN button:

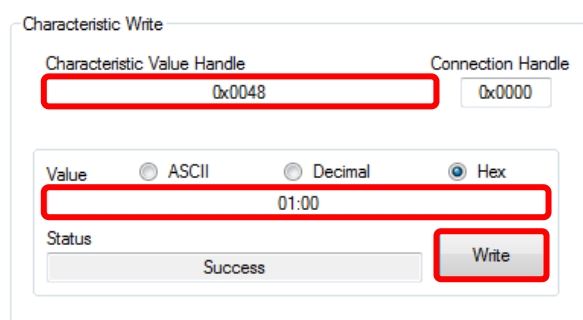


After the scanning is complete, choose the device to connect to and press "Establish".



5. Button Notifications

To notify when buttons are presses on the CC2540 Keyfob, notifications need to be enabled. This is done in the "Read/Write" Tab of BTool. Simply write 01:00 to character handle 0x0048.



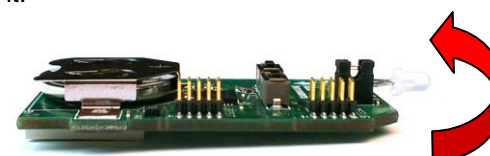
If a button on the CC2540 Keyfob is now pushed, notifications will be sent and can be monitored in the BTool log window.

6. Enable Accelerometer

Similar to the button notifications, the notifications for the accelerometer data can be enabled. In this example we will only enable notifications for the x-axis.

First of all, the accelerometer need to be enabled, which is done by writing 01:00 to character handle 0x0034 in the "Read/Write" tab of BTool.

To enable notifications for the x-axis, write 01:00 to character handle 0x003B. This will enable the CC2540 Keyfob to send notifications as you move it.

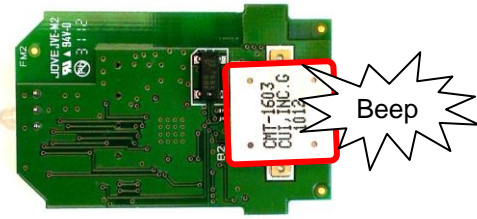


7. Immediate Alert

To sound the buzzer located on the CC2540 Keyfob, write the following value to handle 0x0028:

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

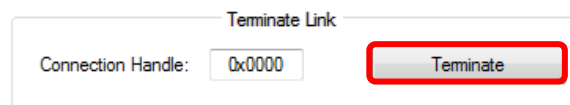
The buzzer will sound for 10 seconds.



8. Terminate Connection

To terminate the connection you will have three options:

- Remove the battery from the CC2540 Keyfob, which will trigger a supervision timeout.
- Move the CC2540 Keyfob out of range (typically >10m), which will trigger a supervision timeout.
- Press the "Terminate" button in BTool as indicated in the image below.



9. Source Code

The project and source code files for the pre programmed 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 (CC2540 Slave configuration)**. The project can be modified as desired, and should provide a good framework for developing your own custom BLE applications.

More details on these projects can be found within the BLE Software Developer's Guide, which is included with the stack.

For troubleshooting please refer to the CC2540XDK-MINI User Guide, found at...

Evaluate Using iPhone 4S/5

1. Download the Application

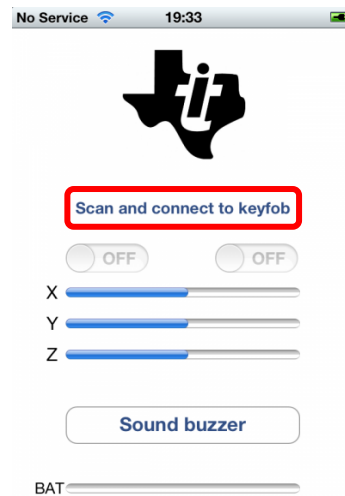
The iPhone 4S/5 app can be downloaded via iTunes (found at www.apple.com/itunes) or App Store which are pre installed on the iPhone 4S/5.

TI BLE SensorTag
By Texas Instruments Incorporated
Open iTunes to buy and download apps.



!! This image will be updated when App released

2. Connect to CC2541 Keyfob



!! This image will be updated when App released

3. Evaluate the Application

TBD

Additional Tools and Links

BLE Packet Sniffer

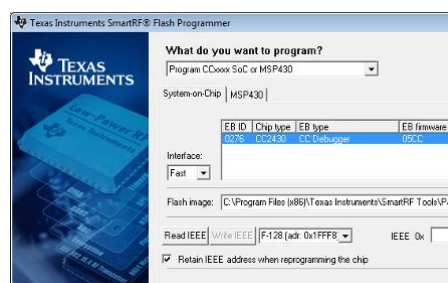
The CC2540 USB Dongle can be used as a BLE sniffer and monitor packets while the iPhone 4S Demo is running.



The SmartRF Protocol Packet Sniffer software can be downloaded at www.ti.com/packetsniffer

SmartRF Flash Programmer

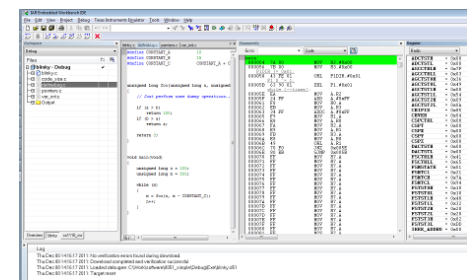
Texas Instruments has a simple tool which can be used to program and flash the CC2540.



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

IAR Embedded Workbench

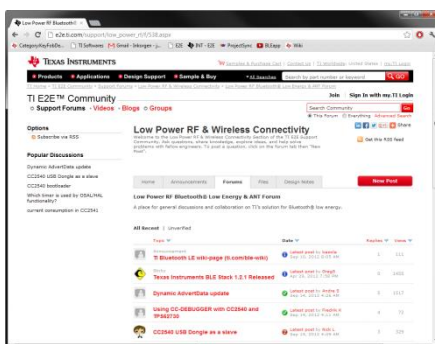
To develop software, program, and debug the CC2540, you should use IAR Embedded Workbench for 8051.



More information on IAR EW8051, including a free evaluation version download, can be found at www.iar.com/ew8051.

BLE E2E Forum

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



BLE Wiki

Our BLE Wiki contains application examples, guides and documentation covering those extra steps you might need help with. The Wiki is not only managed by Texas Instruments employees but also 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.

Useful Links

TI BLE Stack and Software:
www.ti.com/ble-stack

CC2540/41 Development Kit User Guide:
www.ti.com/lit/pdf/swru####

CC2540/41 BLE Software Developer's Guide:
www.ti.com/lit/pdf/swru271

CC2540/41 User's Guide:
<http://www.ti.com/lit/pdf/swru191>

CC2541 Product Page:
www.ti.com/cc2541

EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used. TI currently deals with a variety of customers for products, and therefore our arrangement with the user is not exclusive. TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.

REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

【Important Notice for Users of this Product in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

Texas Instruments Japan Limited
(address) 24-1, Nishi-Shinjuku 6 chome, Shinjuku-ku, Tokyo, Japan

<http://www.tij.co.jp>

【ご使用にあたっての注】

本開発キットは技術基準適合証明を受けておりません。

本製品のご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。

日本テキサス・インスツルメンツ株式会社
東京都新宿区西新宿6丁目24番1号
西新宿三井ビル

<http://www.tij.co.jp>

EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate the components for possible use in safety critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2012, Texas Instruments Incorporated