

Bluetooth SensorTag Quick Start Guide



Opening the Box and Using the SensorTag

The SensorTag simplifies development of *Bluetooth* low energy sensor applications. It allows app developers to quickly and easy write smart phone apps for *Bluetooth* low energy accessories without any embedded hardware or software development.

www.ti.com/SensorTag

1. Kit Contents



- SensorTag
- 1x CR2032 Battery
- Documentation

The RF boards in this kit are FCC and IC certified and tested/complies with ETSI/R&TTE over temperature from 0 to +35°C¹. The RF board have integrated PCB antenna.

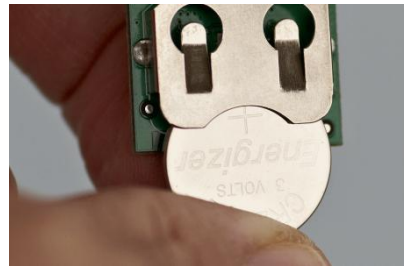
Caution! Dispose the battery properly and keep out of reach of children. If swallowed, contact a physician immediately.



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

2. Assembly of the SensorTag

Insert the battery² in the battery connector and place the printed circuit board in the black plastic cover with the battery facing down.



Note that when inserting the battery for the first time, the PCB contact point surface has a thin layer of solder residue that may prevent contact with the battery. Remove and insert the battery a few times to power the SensorTag.

Push the side button to check if the battery is correctly inserted. When the button is pushed the LED marked D1 should start to blink.

Add the transparent plastic cover to close the inner hard plastic pieces.



Complete the assembly of the SensorTag by adding the red plastic cover.



3. Sensors

The SensorTag is fitted with six sensors and all sensors are chosen to be small, energy efficient and low cost surface mount devices. The sensors use I2C interface and are connected to the same interface bus with separate enable signals. To minimize current consumption all sensors are by default disabled and they are in sleep mode between measurements. Each sensor can be enabled and read individually. The SensorTag includes the following sensors:

- IR Temperature Sensor (TMP006) from Texas Instruments, <http://www.ti.com/product/tmp006>
- Humidity Sensor (SHT21) from Sensirion, <http://www.sensirion.com/en/products/humidity-temperature/humidity-sensor-sht21/>
- Pressure Sensor (T5400) from Epcos, <http://www.epcos.com/inf/57/ds/T5400.pdf>
- Accelerometer (KXTJ9) from Kionix, <http://www.kionix.com/accelerometers/kxtj9>
- Gyroscope (IMU-3000) from InvenSense, <http://www.invensense.com/mems/gyro/imu3000.html>
- Magnetometer (MAG3110) from Freescale, http://www.freescale.com/webapp/sps/site/pr od_summary.jsp?code=MAG3110

4. Downloading the app from App Store

The SensorTag can communicate with any *Bluetooth* 4.0 enabled devices, for instance a smart phone or a tablet.

Currently the TI *Bluetooth* SensorTag app is only supported for *Bluetooth* 4.0 enabled iOS devices (iPhone 4S, iPhone 5, iPod Touch and the new iPad). There is currently no common *Bluetooth* low energy Application Program Interface (API) for Android devices available.

Download the TI *Bluetooth* SensorTag app from Apple's App Store:

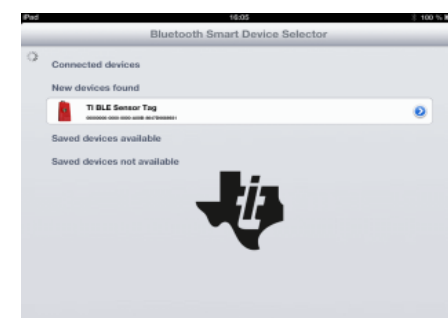


Or search for SensorTag on App Store.

5. Connecting to a Bluetooth 4.0 enabled iDevice

For a *Bluetooth* 4.0 iOS Device to communicate with the SensorTag, Bluetooth needs to be turned on and the SensorTag needs to be advertising. The SensorTag can enable and disable advertising by pushing the side button. When the SensorTag is advertising the green LED (D1) is blinking. It might be hard to see the blinking LED when the SensorTag is fully assembled.

Start the TI *Bluetooth* SensorTag app. When the app is launched it will search for all *Bluetooth* low energy devices in the area. Enable advertising by clicking on the side button. The SensorTag icon should appear indicating a successful connection.



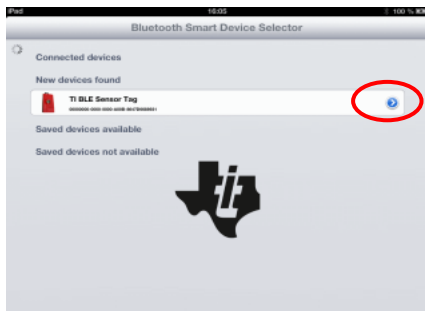
If no *Bluetooth* 4.0 devices are detected by the SensorTag within 30 seconds, advertising will stop and the SensorTag will go back to sleep. To re-activate advertising and turning on the SensorTag press the side button once more.

¹ Operating temperature for CC2541 is -40 to 85C
² Maximum input voltage is 3.6V

6. Use the SensorTag app

The TI *Bluetooth* SensorTag app allows you to create your “own” app by selecting the different sensors you want to use.

When connected to the SensorTag click on the arrow next to the SensorTag symbol to get to the sensor selection screen.



Select the different sensors by turning them ‘on’. Adjust the sensor data collection interval by moving the sliding bars, and select which axis to display for the multi-axis sensors. When you click ‘**Show application**’ the TI *Bluetooth* SensorTag app will display the selected sensor data with selected data interval.

To view and store the sample code of the selected sensor configuration select ‘**Store sensor configuration**’.

Go back to ‘**SensorTag device details**’ to select another combination of sensor data to display.

Source code for the *Bluetooth* low energy SensorTag app can be found at: http://processors.wiki.ti.com/index.php/Bluetooth_SensorTag

7. Using the app as an attribute and service explorer

In addition you can use the TI *Bluetooth* SensorTag app to read the services and attributes of any *Bluetooth* low energy enabled device.

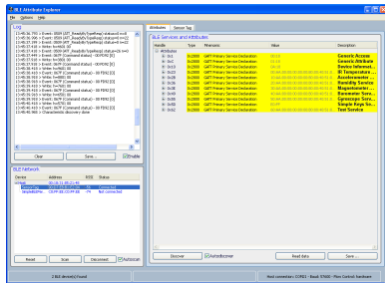
Connect the *Bluetooth* low energy device, and make sure that the *Bluetooth* low energy device is advertising prior to connecting.

When connected select the arrow next to the device name and then select ‘**Service discovered**’ and/or ‘**Characteristics discovered**’ to view the services and characteristics of the *Bluetooth* low energy device.

Click on the arrow next to ‘Service discovered’ and ‘Characteristics discovered’ to display the Services and Characteristics.

8. Using the SensorTag with TI’s BLE Device Monitor

Download and install TI’s BLE Device Monitor from: www.ti.com/SensorTag. Please note that you also need a CC2540 USB dongle to use the BLE Device monitor.



The BLE Device Monitor allows you to discover, read and alter attributes on any BLE device. More detailed information about the BLE Device Monitor can be found at: www.ti.com/SensorTag

Note that BLE Device Monitor is currently only supported on Windows 7/XP.

9. Supported platforms

To use the SensorTag a *Bluetooth* 4.0 device is required and the API of the device must support the *Bluetooth* low energy API. Currently the following devices are supported:

- iPhone 4S
- iPhone 5
- iPad (3)
- iPod Touch (5th generation)
- MacBook Air (2011 model and newer)
- MacBook Pro (2012 model and newer)
- Any Windows PC with CC2540 USB dongle connected using BLE Device Monitor. Part of TI BLE stack v1.30 and newer.

10. Next steps

1. Learn more about the SensorTag and the BLE Device Monitor at: www.ti.com/SensorTag

2. Download the TI *Bluetooth* low energy stack at: <http://www.ti.com/tool/ble-stack>

3. Meet other *Bluetooth* low energy developers and get technical support at: http://e2e.ti.com/support/low_power_rf/f/538.aspx

Electronic version of the quick start guide, got to: <http://www.ti.com/lit/swru324>

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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.

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

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

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