

# **CC3200 SimpleLink™ Wi-Fi® and IoT Solution with MCU LaunchPad Hardware**

## **User's Guide**



Literature Number: SWRU372B  
June 2014—Revised January 2015

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>Introduction.....</b>                  | <b>4</b>  |
| 1.1      | CC3200 LaunchPad .....                    | 4         |
| 1.2      | Key Features .....                        | 4         |
| 1.3      | What's Included .....                     | 5         |
| 1.4      | FCC/IC Regulatory Compliance.....         | 5         |
| <b>2</b> | <b>Hardware Description .....</b>         | <b>5</b>  |
| 2.1      | Block Diagram .....                       | 6         |
| 2.2      | Hardware Features.....                    | 6         |
| 2.3      | Connecting a BoosterPack.....             | 7         |
| 2.4      | Jumpers, switches and LEDs.....           | 7         |
| 2.5      | Power.....                                | 15        |
| 2.6      | Measure CC3200 Current Draw .....         | 17        |
| 2.7      | RF Connections.....                       | 20        |
| 2.8      | Design Files .....                        | 21        |
| <b>3</b> | <b>Software Examples .....</b>            | <b>22</b> |
| 3.1      | Development Environment Requirements..... | 22        |
| <b>4</b> | <b>Additional Resources.....</b>          | <b>22</b> |
| 4.1      | LaunchPad Wiki.....                       | 22        |
| 4.2      | Information on the CC3200.....            | 22        |
| 4.3      | Download CCS, IAR.....                    | 22        |
| 4.4      | The CC3200 Code Examples .....            | 22        |
| 4.5      | CC3200 Application Notes .....            | 22        |
| 4.6      | The Community .....                       | 23        |
| <b>5</b> | <b>Known Limitations.....</b>             | <b>23</b> |
| 5.1      | Hardware Limitations.....                 | 23        |
|          | <b>Revision History.....</b>              | <b>24</b> |
|          | <b>Revision History.....</b>              | <b>24</b> |

## List of Figures

|    |   |    |
|----|---|----|
| 1  | CC3200 LaunchPad EVM Overview .....                 | 5  |
| 2  | CC3200 Block Diagram .....                          | 6  |
| 3  | Pn-1 Marking on the LaunchPad (white triangle)..... | 7  |
| 4  | JTAG Headers .....                                  | 7  |
| 5  | I2C Connections .....                               | 8  |
| 6  | UART Signals.....                                   | 10 |
| 7  | SOP Jumpers .....                                   | 11 |
| 8  | 2x20 Pin Connector .....                            | 15 |
| 9  | Powering From USB .....                             | 16 |
| 10 | Battery Power.....                                  | 17 |
| 11 | Measuring Low Power .....                           | 18 |
| 12 | Measuring Active Power.....                         | 19 |
| 13 | Radiated Testing Using Chip Antenna .....           | 20 |
| 14 | Board Set for Conducted Testing .....               | 20 |

## List of Tables

|    |                              |    |
|----|------------------------------|----|
| 1  | JTAG Headers .....           | 8  |
| 2  | Jumper Settings.....         | 8  |
| 3  | Default I2C Addresses .....  | 9  |
| 4  | Jumper Settings.....         | 9  |
| 5  | UART Signals.....            | 10 |
| 6  | SOP Lines.....               | 11 |
| 7  | Miscellaneous Settings ..... | 12 |
| 8  | Push Buttons.....            | 13 |
| 9  | LEDs .....                   | 14 |
| 10 | Change Log .....             | 21 |

# **CC3200 SimpleLink™ Wi-Fi® and IoT Solution with MCU LaunchPad Hardware**

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## **1 Introduction**

### **1.1 CC3200 LaunchPad**

The high performance CC3200 is the industry's first single-chip Microcontroller (MCU) with built-in Wi-Fi connectivity for the LaunchPad™ ecosystem. Created for the Internet of Things (IoT), the SimpleLink Wi-Fi CC3200 device is a wireless MCU that integrates a high-performance ARM® Cortex®-M4 MCU allowing customers to develop an entire application with a single IC. With on-chip Wi-Fi, internet and robust security protocols, no prior Wi-Fi experience is needed for faster development.

The CC3200 LaunchPad is a low-cost evaluation platform for ARM® Cortex™-M4F-based microcontrollers. The LaunchPad design highlights the CC3200 Internet-on-a-chip™ solution and Wi-Fi capabilities. The CC3200 LaunchPad also features programmable user buttons, RGB LED for custom applications and onboard emulation for debugging. The stackable headers of the CC3200 LaunchPad XL interface demonstrate how easy it is to expand the functionality of the LaunchPad when interfacing with other peripherals on many existing BoosterPack add-on boards such as graphical displays, audio codec, antenna selection, environmental sensing, and much more. [Figure 1](#) shows a photo of the CC3200 LaunchPad.

Free software development tools are also available, including TI's Eclipse-based [Code Composer Studio™](#) and [IAR Embedded Workbench®](#). More information about the LaunchPad, the supported BoosterPacks, and the available resources can be found at [TI's LaunchPad portal](#). Also visit the [CC3200 Wiki page](#) for design resources and example projects.

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**NOTE:** The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

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**NOTE:** All figures and references in this document apply to the Rev3.2. Most of the document also applies to the Rev4.1, unless otherwise stated. For the exact list of changes made across board revisions, refer to [Section 2.8.2](#).

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### **1.2 Key Features**

- CC3200, SimpleLink Wi-Fi, internet-on-a-chip™ solution with integrated MCU
- 40-pin LaunchPad standard that leverages the BoosterPack ecosystem
- FTDI based JTAG emulation with serial port for Flash programming
- Two buttons and three LEDs for user interaction
- Backchannel universal asynchronous receiver/transmitter (UART) through USB to PC
- On-board chip antenna with U.FL for conducted testing

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ARM, Cortex are registered trademarks of ARM Limited.  
IAR Embedded Workbench is a registered trademark of IAR Systems AB.  
Wi-Fi is a registered trademark of Wi-Fi Alliance.  
All other trademarks are the property of their respective owners.

- On-board accelerometer and temperature sensor for out-of-box demo
- Micro USB connector for power and debug connections

### 1.3 What's Included

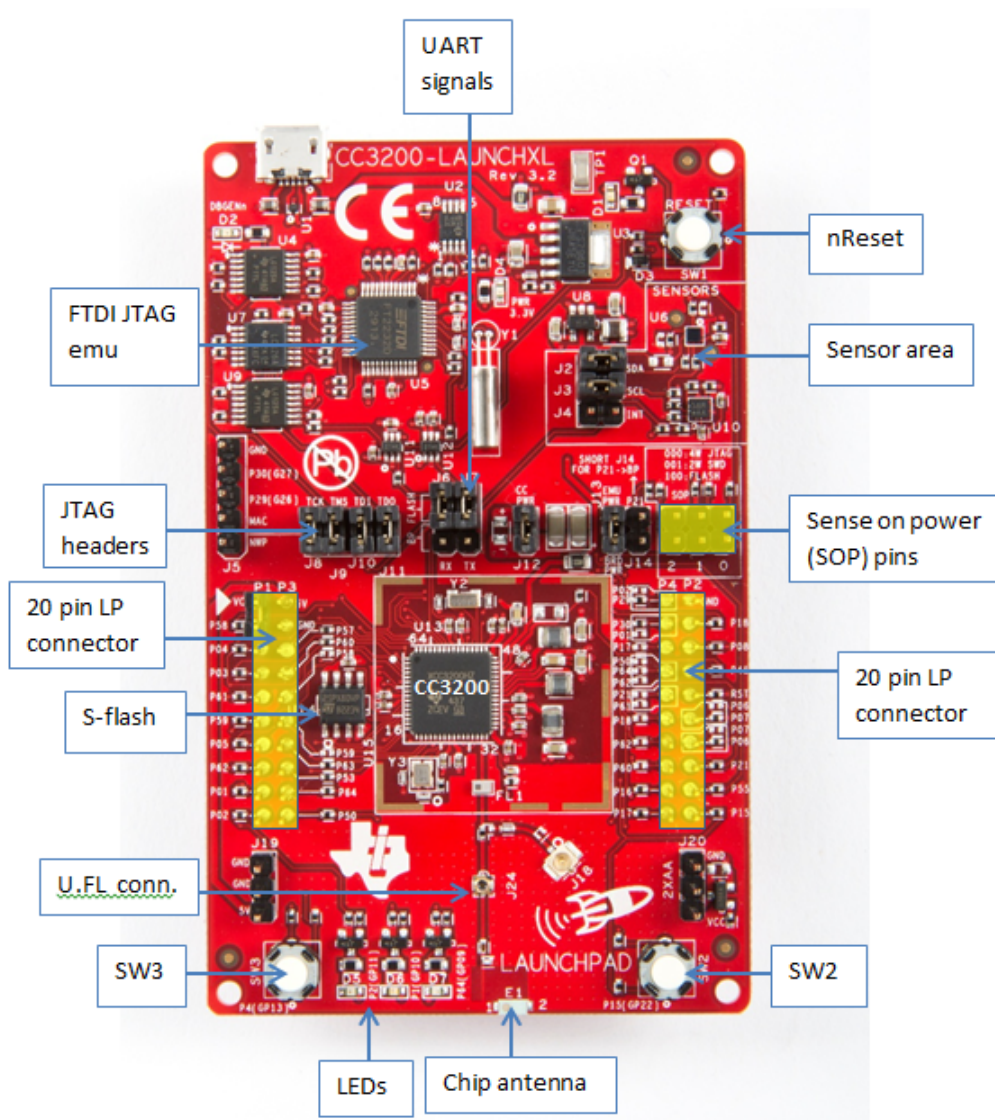
#### Kit Contents

- CC3200 LaunchPad development tool
- Micro USB cable
- Quick start guide

### 1.4 FCC/IC Regulatory Compliance

The CC3200 SimpleLink Wi-Fi and IoT solution with MCU LaunchPad hardware is FCC Part 15 and IC ICES-003 Class A compliant.

## 2 Hardware Description



**Figure 1. CC3200 LaunchPad EVM Overview**

## 2.1 Block Diagram

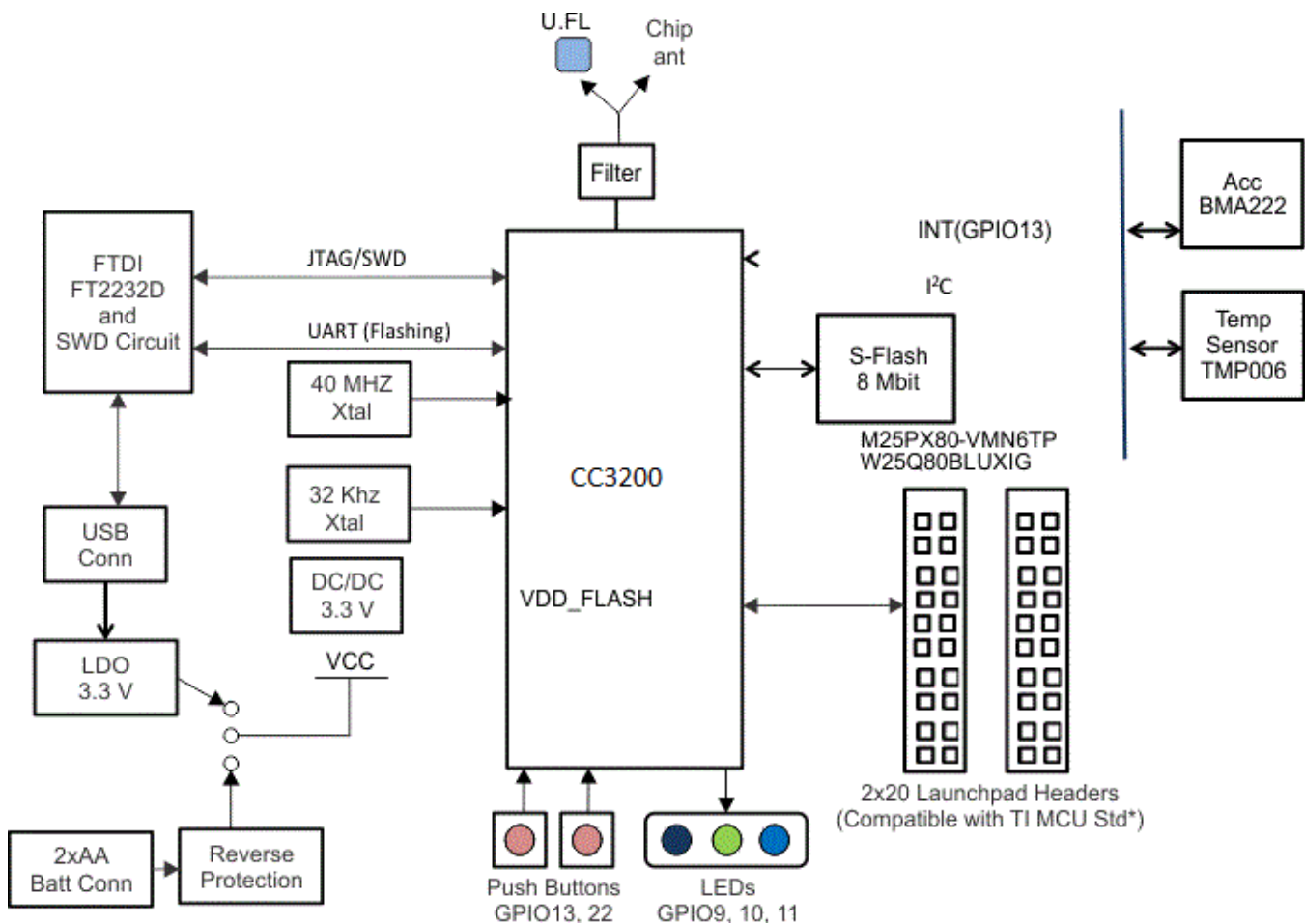


Figure 2. CC3200 Block Diagram

## 2.2 Hardware Features

- CC3200, SimpleLink Wi-Fi, internet-on-a-chip solution with integrated MCU40-pin LaunchPad standard that leverages the BoosterPack ecosystem
- FTDI-based JTAG emulation with serial port for Flash programming
- Supports both 4-wire JTAG and 2-wire SWD
- Two buttons and three LEDs for user interaction
- Virtual COM port UART through USB on PC
- On-board chip antenna with U.FL for conducted testing
- On-board accelerometer and temperature sensor for out-of-box demo with option to isolate them from the inter-integrated circuit (I2C) bus
- Micro USB connector for power and debug connections
- Headers for current measurement and external JTAG connection
- Bus-powered device with no external power required for Wi-Fi
- Long range transmission with highly optimized antenna (200m typical in open air with a 6dBi antenna AP)
- Can be powered externally, with 2xAA or 2xAAA alkaline batteries working down to 2.3V typical (typ)

## 2.3 Connecting a BoosterPack

A compatible BoosterPack can be stacked on top of the LaunchPad using the 2x20 pin connectors. Note that the connectors do not have a “key” to prevent the misalignment of the pins or reverse connection. Ensure that Vcc and 5V pins, are aligned with the BoosterPack header pins. On the CC3200 LaunchPad, a small white triangle symbol is provided near Pin-1 (see [Figure 3](#)) to orient all BoosterPacks. This same marking, provided on compatible BoosterPacks, needs to be aligned before powering up the boards.



Figure 3. Pn-1 Marking on the LaunchPad (white triangle)

## 2.4 Jumpers, switches and LEDs

### 2.4.1 JTAG Headers

The headers are provided on the board to isolate the CC3200 device from the mounted FTDI JTAG emulator. These jumpers are shorted by default when the board is shipped from TI. To connect an external emulator, remove these jumpers and place the external emulator on the pins closer to the CC3200 device.



Figure 4. JTAG Headers



**Table 1. JTAG Headers**

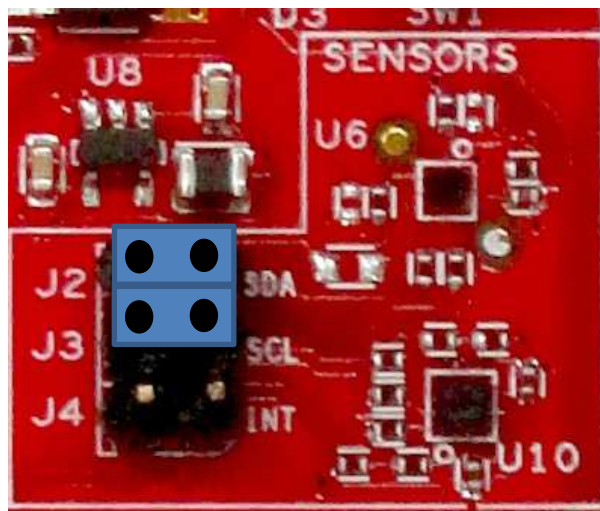
| Reference               | Usage | Comments   |
|-------------------------|-------|--|
| J8 (TCK) <sup>(1)</sup> | JTAG  | Short : Routes the on-board emulator to the CC3200   |
| J9 (TMS) <sup>(1)</sup> |       |  |
| J10 (TDI)               |       | Open: Isolate the on-board emulator from the CC3200. |
| J11(TDO)                |       |  |

<sup>(1)</sup> For the SWD mode, only TCK and TMS need to be shorted to the CC3200.

When a battery is used, be sure to disconnect all the JTAG headers to prevent any reverse leakage current.

## 2.4.2 I2C Connections

The board features an accelerometer and a temperature sensor for the out-of-box demo. These are connected to the I2C bus and can be isolated using the jumpers provided.


**Figure 5. I2C Connections**

By removing J2 and J3, the accelerometer and the temperature sensors are isolated from the I2C bus. Note that this also removes any pull-up resistor from the I2C bus.

### 2.4.2.1 Jumper Settings

**Table 2. Jumper Settings**

| Reference | Usage   | Comments  |
|-----------|---------|---|
| J2        | I2C SDA | Short : Connect the CC3200 I2C bus to the on-board sensors with pull-up<br>Open : Isolate the sensors from the CC3200 |
| J3        | I2C SCL | Short : Connect the CC3200 I2C bus to the on-board sensors with pull-up<br>Open : Isolate the sensors from the CC320  |
| J4        | INT     | Short : Connect the accelerometer interrupt to the CC3200 on GPIO13   |



### 2.4.2.2 Default I2C Address

**Table 3. Default I2C Addresses**

| Sensor Type   | Ref | Part Number | Slave Address |
|---------------|-----|-------------|---------------|
| Temp sensor   | U6  | TMP008      | 0x41          |
| Accelerometer | U10 | BMA222      | 0x18          |

### 2.4.3 Power Connections

The board can be powered by using the on-board micro USB connector. An on-board LDO provides 3.3 V for the CC3200 and the rest of the board to operate. This supply can be isolated from the LDO using the jumpers on the board.

**Table 4. Jumper Settings**

| Reference | Usage               | Comments   |
|-----------|---------------------|--|
| J12       | Current measurement | Measures the current flowing into the CC3200 device.   |
| J13       | Board power         | Short: Supply the board power from the on-board LDO.<br>Open: Supply the board power from the J20 (battery connector)  |
| J19       | 5 V power           | 5 V output from the USB VBUS (has a diode drop of up to 0.4 V)   |
| J20       | 3.3 V power input   | Can be used to power the board from an external 2XAA battery pack. It has in-built reverse voltage protection to prevent the battery from being plugged in the reverse manner. |

## 2.4.4 UART Signals

The board supports a USB-based virtual COM port, which is used on the FTDI device FT2232D. There are two ports on the FT2232: the first port is dedicated for the emulation (JTAG/SWD) and the second port is used for the virtual COM port. The UART can also be routed to the 20-pin connector and the selection is performed using jumpers on the board.

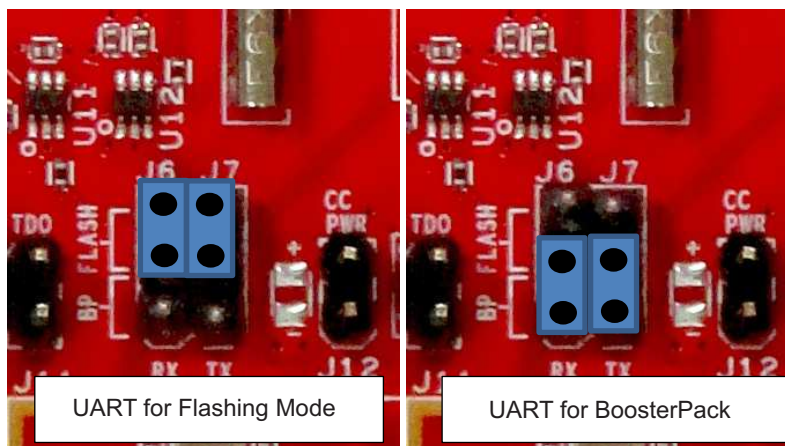


Figure 6. UART Signals

Table 5. UART Signals

| Reference | Usage                      | Comments   |
|-----------|----------------------------|--|
| J6, J7    | UART for Flash programming | Short 1-2: Route the signals to the 20 pin connector.<br>Short 2-3: Route the signals to the FTDI for Flash programming. |

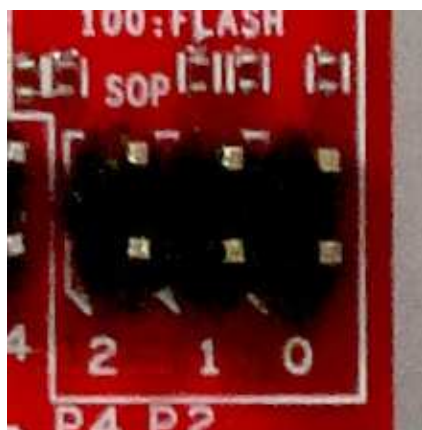
### 2.4.5 Sense on Power

The CC3200 can be set to operate in three different modes based on the state of the Sense on Power (SOP) lines. These are pins 21, 34, 35 on the CC3200 device. The state of the device is described in [Table 6](#).

**Table 6. SOP Lines**

| Usage    | Comments  |
|----------|---|
| SOP[2:0] | 100 = Flash programming<br>000 = Functional mode + 4 Wire JTAG<br>001 = Functional mode + 2 Wire JTAG |



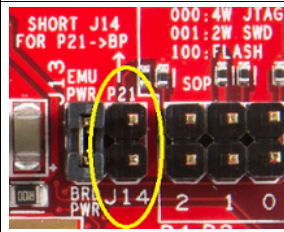
**Note:** SOP[2:0] corresponds to J15, J16, and J17, in the LaunchPad schematic design.



**Figure 7. SOP Jumpers**

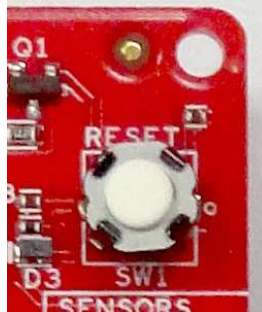


## 2.4.6 Other Miscellaneous

**Table 7. Miscellaneous Settings**


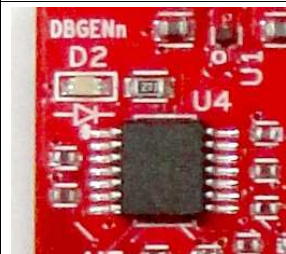
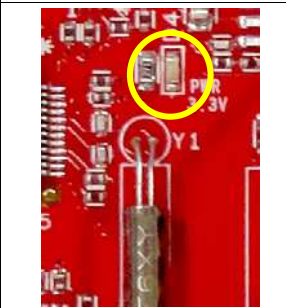
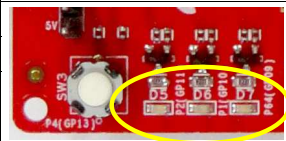
| Reference | Usage                   | Comments  |  |
|-----------|-------------------------|---|--|
| J4        | Accelerometer Interrupt | Short = Route the Accelerometer sensor interrupt to the GPIO_13<br>Open = Isolates the Interrupt to the GPIO_13 |   |
| J5        | Debug Header            | To observe the Network Processor (NWP), MAC Logs.   |   |
| J14       | SOP2 Isolation          | Isolate SOP2 (GPIO_25) from the 20 pin connector  |  |

## 2.4.7 Push Buttons and LEDs

**Table 8. Push Buttons**

| Reference | Usage   | Comments  |  |
|-----------|---------|---|--|
| SW1       | RESET   | This is used to RESET the CC3200 device. This signal is also output on the 20-pin connector to RESET any external BoosterPack which may be stacked. |   |
| SW2       | GPIO_22 | When pushed, the GPIO_22 will be pulled to VCC.   |   |
| SW3       | GPIO_13 | When pushed, the GPIO_13 will be pulled to VCC.   |  |

**Table 9. LEDs**

| Reference | Color  | Usage                  | Comments  |   |
|-----------|--------|------------------------|---|---|
| D1        | Yellow | nRESET                 | This LED is used to indicate the state of nRESET pin. If this LED is glowing, the device is functional. |    |
| D2        | Green  | Debug                  | This LED glows whenever the debugging is enabled over the JTAG  |    |
| D4        | RED    | Power                  | Indicates when the 3.3 V power is supplied to the board.  |   |
| D5        | GREEN  | GPIO_11 <sup>(1)</sup> | Glow when the GPIO is logic-1   |  |
| D6        | YELLOW | GPIO_10 <sup>(1)</sup> | Glow when the GPIO is logic-1   |   |
| D7        | RED    | GPIO_09                | Glow when the GPIO is logic-1   |   |

<sup>(1)</sup> GPIO\_10 and GPIO\_11 are used as I2C also. So whenever the pull-ups are enabled, the LEDs would glow.

## 2.4.8 2x20 Pin Connector Assignment

The signal assignment on the 2x20 pin connector is shown in Figure 8. The P1-Pn naming convention is used for 2x20 pin connectors only.

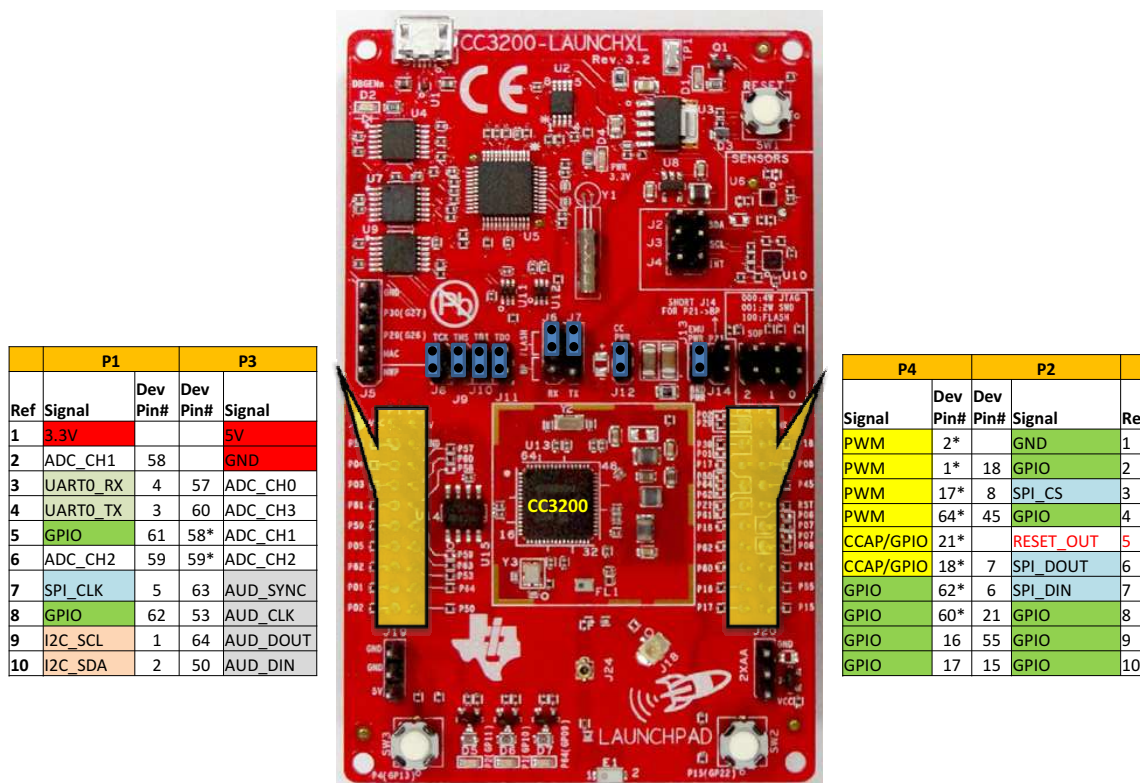


Figure 8. 2x20 Pin Connector

The signal mappings are as indicated in above table shown in Figure 8. All the signals are referred by the pin number in the SDK and Figure 8 shows the default mappings. Note that some of the pins are repeated across the connector. For instance, pin 62 is available on P1 and P4, but only P1 is connected by default. The signal on P4 is marked with a \*(star) to signify that it is not connected by default. It can be routed to the pin by using a 0  $\Omega$  resistor in the path. For the exact resistor placement, see the [schematics and placement diagram](#).

## 2.5 Power

The LaunchPad is designed such that it can be powered by the USB connection or by external 2xAA/2xAAA batteries.

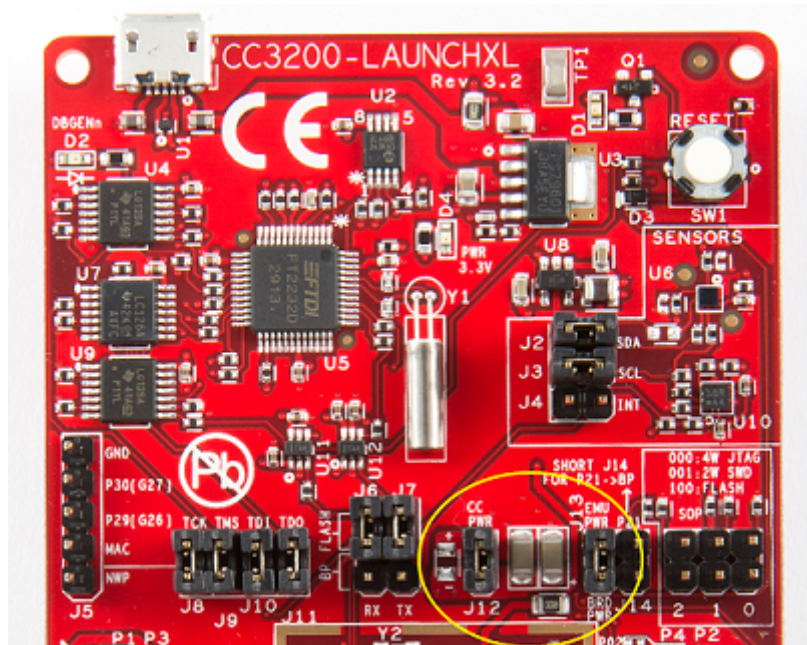


### 2.5.1 USB Power

The LaunchPad is designed to work from the USB provided power supply. The LaunchPad will enumerate as a bus-powered device on the computer. When the board is powered from the USB connector, make sure that the jumpers are placed on the following headers, as shown in [Figure 9](#).

J12 (shorted)

J13 (shorted)

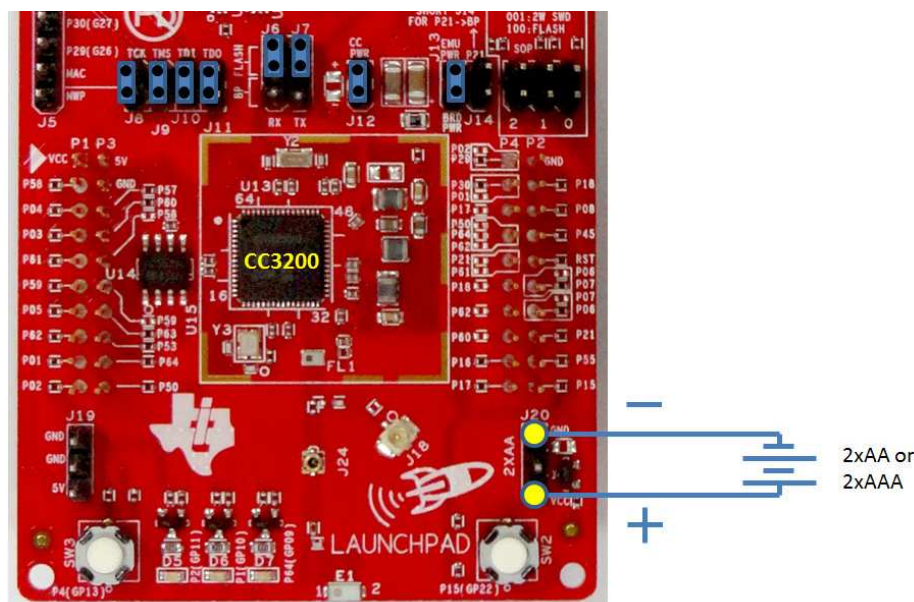


**Figure 9. Powering From USB**

## 2.5.2 Battery Power (2 x 1.5 V)

The LaunchPad can also be powered from an external battery pack by feeding the voltage on the J20 header. This input features reverse voltage protection to ensure that the board is not damaged due to an accidental reverse voltage. The following care should be taken while using the board with a battery

1. Remove the USB cable.
2. Plug-in the battery pack on J20 with correct polarity (see [Figure 10](#)).



**Figure 10. Battery Power**

## 2.5.3 BoosterPack Power Supply

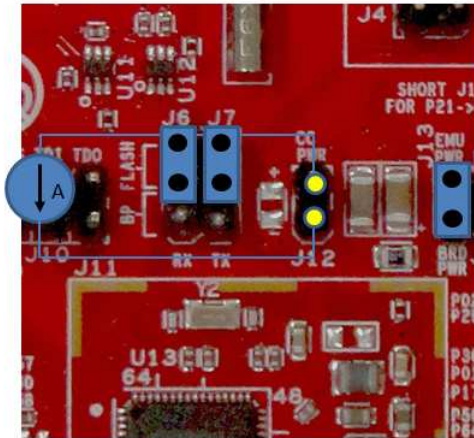
The CC3200 LaunchPad can be powered by a stacked booster-pack which can provide a 3.3 V power on P1.1. During this mode, ensure that the J13 is removed so that the on-board LDO is not overloaded.

## 2.6 Measure CC3200 Current Draw

To measure the current draw of the CC3200, use the 3V3 jumper on the jumper isolation block. (J12). The current measured in this mode includes only the CC3200 current and no external blocks. However, if a GPIO of the CC3200 is driving a high current load like LED, then that is also included in this measurement.

### 2.6.1 Measuring Low Power (< 1mA)

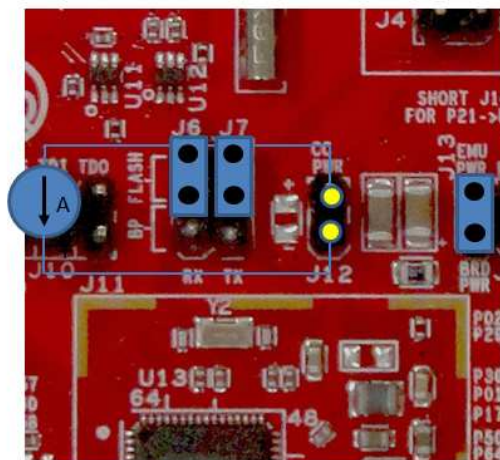
Follow these steps to measure ultra-low power:



**Figure 11. Measuring Low Power**

1. Remove the 3V3 jumper (J12); attach an ammeter across this jumper.
2. Make sure that the CC3200 is not driving any high current loads directly like an LED as this can cause large current drawn.
3. Begin target execution and set the device to low-power modes (LPDS or Hibernate).
4. Measure the current. (Keep in mind that if the current levels are fluctuating, it may be difficult to get a stable measurement. It is easier to measure quiescent states.)

### 2.6.2 Measuring Active Power



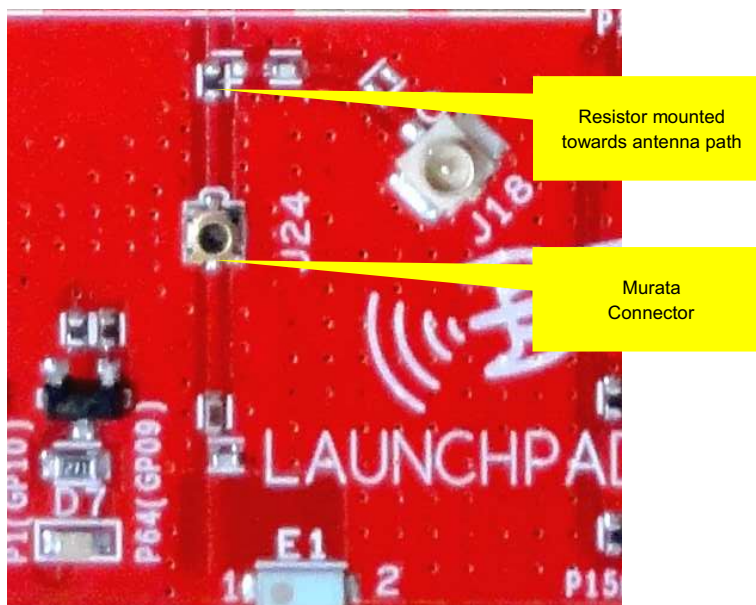
### Figure 12. Measuring Active Power

1. Remove the 3V3 jumper (J12).
2. Solder a  $0.1\ \Omega$  resistor on the board at R62. Or, attach a jumper wire between J12 so that it can be used with a current probe.
3. Measure the voltage across the R62 using an oscilloscope with a differential probe. (For the current probe, coil the wire around the sensor multiple times for good sensitivity).
4. An ammeter can also be used for this measurement, but the results may be erroneous due to the switching nature of the current.

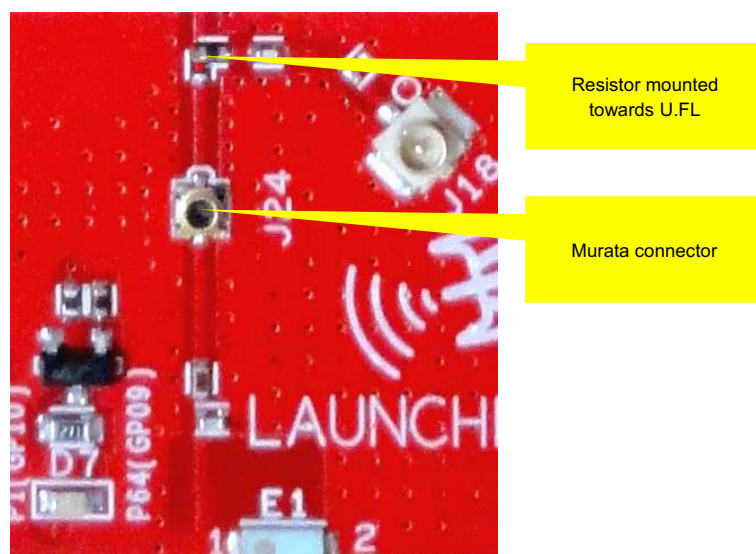
## 2.7 RF Connections

### 2.7.1 Radiated Testing (AP connection)

By default the board ships with the RF signals routed to the on-board chip antenna. An on-board u.fl (Murata) connector provides a means to perform the testing in the lab using a compatible cable.



**Figure 13. Radiated Testing Using Chip Antenna**



**Figure 14. Board Set for Conducted Testing**

## 2.8 Design Files

### 2.8.1 Hardware

All design files include schematics, layout, Bill of Materials (BOM), Gerber files and documentation, which are made available for download from the following URL: <http://www.ti.com/tool/cc3200-launchxl-rd>.

### 2.8.2 Revision History

**Table 10. Change Log**

| PCB Revision | Description   |
|--------------|---|
| Rev 3.0B     | <ul style="list-style-type: none"> <li>First baseline revision</li> </ul>   |
| Rev 3.1      | <p>The main changes pertain to the bill of materials (BOM) and the layout:</p> <ul style="list-style-type: none"> <li>Replaced the caps C23, C24 with ceramic ones to minimize leakage current</li> <li>R62 is made to DNP by default so that the jumper is used to measure the hibernate current</li> <li>Misc silk screen changes in order to clearly annotate components on the board.</li> </ul>  |
| Rev 3.2      | <ul style="list-style-type: none"> <li>Layout changes for the DC-DC section in order to improve the mask margin</li> <li>Updated the silk screen to reflect the final markings.</li> </ul>  |
| Rev 4.1      | <ul style="list-style-type: none"> <li>Added pull-up/pull-downs for the serial flash. (Reduces hibernate current to around 17 uA)</li> <li>Moved the nRESET pull from VCC_BRD to VBAT_CC (Ensures always pulled high).</li> <li>Added pull-up on UART_TX going to the FTDI to prevent false start bits.</li> <li>Added pull-up resistor for Acccelerometer address to avoid conflict with Audio Booster pack</li> <li>Added 100K pull-up on RESET_OUT net for any BP without RESET pulls.</li> <li>Changed R61 to 2.7K, R57-&gt; 270 Ohms (To solve false entering to bootloader mode)</li> <li>Miscellaneous silk changes</li> </ul> |

### 2.8.3 Software

All design files including firmware patches, software example projects, and documentation are made available from the [SimpleLink Wi-Fi Platform page](#).

The Software Development Kit (SDK) to use with the CC3200 LaunchPad can be obtained from <http://www.ti.com/tool/cc3200sdk>.



## 3 Software Examples

### 3.1 Development Environment Requirements

To use any of the following software examples with the LaunchPad, you must have an integrated development environment (IDE) that supports the CC3200 device.

For more details on where to download the latest IDE, see [Section 4.3](#).

The CC3200 Programmer's guide ([SWRU369](#)) has detailed information on software environment setup, and examples. Please refer to this document for further details on the software sample examples.

#### 3.1.1 CCS

CCS 6.0 or higher is required. When CCS has been launched, and a workspace directory chosen, use *Project* → *Import Existing CCS Eclipse Project*. Direct it to the desired demo's project directory containing `main.c`.

#### 3.1.2 IAR

IAR 6.70 or higher is required. To open the demo in IAR, simply choose *File* → *Open* → *Workspace...*, and direct it to the \*.eww workspace file inside the \IAR subdirectory of the desired demo. All workspace information is contained within this file.

The subdirectory also has an \*.ewp project file; this file can be opened into an existing workspace, using *Project* → *Add-Existing-Project...*

## 4 Additional Resources

### 4.1 LaunchPad Wiki

Most updated information would be available on the [CC3200 Wiki page](#).

### 4.2 Information on the CC3200

For more information on CC3200 visit the product page (<http://www.ti.com/product/cc3200>) (datasheet and key documents like the technical reference manual (TRM)) and Wiki (<http://www.ti.com/simplelinkwifi-wiki>) (Organize information for Getting started, Hardware details, Software details including porting information, Test/Certification and Support and Community).

### 4.3 Download CCS, IAR

Although the files can be viewed with any text editor, more can be done with the projects if they're opened with a [development environment](#) like [Code Composer Studio \(CCS\)](#), [IAR](#), or Energia.

CCS and IAR are each available in a full version, or a free, code-size-limited version. The full out-of-box demo cannot be built with the free version of CCS or IAR (IAR Kickstart) due to the code size limit. To bypass this limitation, a code-size-limited CCS version is provided, that has most functionality integrated into a library. The code that is built into the library is able to be viewed by the user, but it cannot be edited. For full functionality download the full version of either CCS or IAR.

### 4.4 The CC3200 Code Examples

The user's guide for each example can be found within the [Software Development Kit \(SDK\)](#), or on the [SimpleLink Wiki](#).

### 4.5 CC3200 Application Notes

There are many application notes with practical design examples and topics located at the [SimpleLink\(TM\) Wi-Fi\(R\) main wiki page](#), and the [main landing page](#).



## **4.6 The Community**

### **4.6.1 TI E2E Community**

Search the forums at [e2e.ti.com](http://e2e.ti.com). If you cannot find your answer, post your question to the community!

## **5 Known Limitations**

### **5.1 Hardware Limitations**

#### **5.1.1 Floating IO (All Revisions)**

All the GPIO outputs from the CC3200 device would float while the device enters hibernate state. This can cause glitches on the lines if they are not pulled externally.

#### **5.1.2 Board Modification for LPDS Mode**

There must be a 100K pull-down resistor on the pin19 (JTAG\_TCK) for the device to reliably enter the LPDS mode. This is not present on the boards.

#### **5.1.3 Floating S-Flash Lines (Rev 3.2 and Earlier)**

The SPI lines routed from the CC3200 to the on-board serial flash are not pulled up or down using resistors on the board. When the device enters Hibernate state, these pins can be floating and high currents can be drawn by the serial flash.

## Revision History

| Changes from A Revision (August 2014) to B Revision   | Page |
|---|------|
| • Added Board Modification for LPDS Mode section..... | 23   |

## Revision History

| Changes from Original (June 2014) to A Revision                   | Page |
|---|------|
| • Added note. ....  | 4    |
| • Added Rev 4.1 value to table.....                               | 21   |
| • Removed Floating S Flash Lines section. ....                    | 23   |
| • Added Floating S-Flash Lines (Rev 3.2 and Earlier) section..... | 23   |

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

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    - 3.1.2 **For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:**

### CAUTION

## STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES (continued)

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.

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*NOTE: 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

*NOTE: 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.*

## 3.2 Canada

### 3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210

#### Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-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.

#### 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.

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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.

#### Concernant les EVMs avec antennes détachables

## STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES (continued)

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

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1. Use EVMs 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 EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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**STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES (continued)**

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