

# ***bq34210IQ1EVM-826 Evaluation Module***

The bq34210IQ1EVM-826 together with a Microsoft® Windows® 7 (or higher) personal computer (PC), bqStudio, a USB interface (separate item, EV2300 or EV2400), and a battery enables development of a gauging solution geared towards rarely discharged applications.

This user's guide describes the characteristics, operation, and use of the bq34210 evaluation module (EVM). A complete schematic diagram, printed-circuit board (PCB) layouts, and bill of materials (BOM) are included in this document.

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## Trademarks

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## 1 EVM Introduction

### 1.1 EVM Kit

The EVM kit contains:

- One bq34210 evaluation module

### 1.2 Ordering Information

The EVM part number is: bq34210IQ1EVM-826.

### 1.3 Operating Specifications

[Table 1](#) lists the EVM operating specifications.

**Table 1. Operating Specifications**

Specification	MIN	TYP	MAX	Units
Input voltage BATTERY+ to BATTERY-	2.8	3.6	4.5	V
Load control input (J3.3) (load on, 0.5-A load current, 25°C)	3.6	3.8	20	V
Load control input (J3.3) (load off)	0	0	0.5	V
Maximum load current (J3.2) (3.8 V on J3.2)			0.5	A

## 2 Quick Start

Obtain the following items to start developing a gauging solution for rarely discharged applications:

1. bq34210IQ1EVM-826
2. EV2300 or EV2400
3. USB cable compatible with item #2
4. PC with Windows 7 (or higher)
5. bqStudio with bq34210 support (contact TI)
6. Battery cell with compatible chemistry
7. Load resistor

## 2.1 Software Installation

Download bqStudio from TI (contact TI for a download link), and complete the following:

1. Ensure that the EV2300 or EV2400 is not connected to the PC through the USB cable before starting this procedure.
2. Open the archive containing the installation package, and copy its contents into a temporary directory.
3. Open the bqStudio installer file (run as Administrator).
4. Follow the on-screen instructions until completing the software installation.
5. Before starting the evaluation software, connect the EV2300 or EV2400 to the PC using the USB cable.
6. If an EV2300 is connected, wait until the system prompt *New Hardware Found* appears. Choose *Select Location Manually*, and use the *Browse* button to point to the *TIUSBWin2K-XP-1* subdirectory.
7. Answer *Continue* to the warning that drivers are not certified with Microsoft.
8. If the EV2300 is connected, after the previous installation finishes, another system prompt *New Hardware Found* appears. Repeat steps 1 through 5, but specify the directory as *TIUSBWin2K-XP-2*.
9. Answer *Continue* to the warning that drivers are not certified with Microsoft. Driver installation is now finished.
10. For the EV2400, the driver should be installed along with software installation.

## 2.2 Hardware Setup

Figure 1 shows the connections between the PC, the USB interface, the EVM, the battery and the system load.

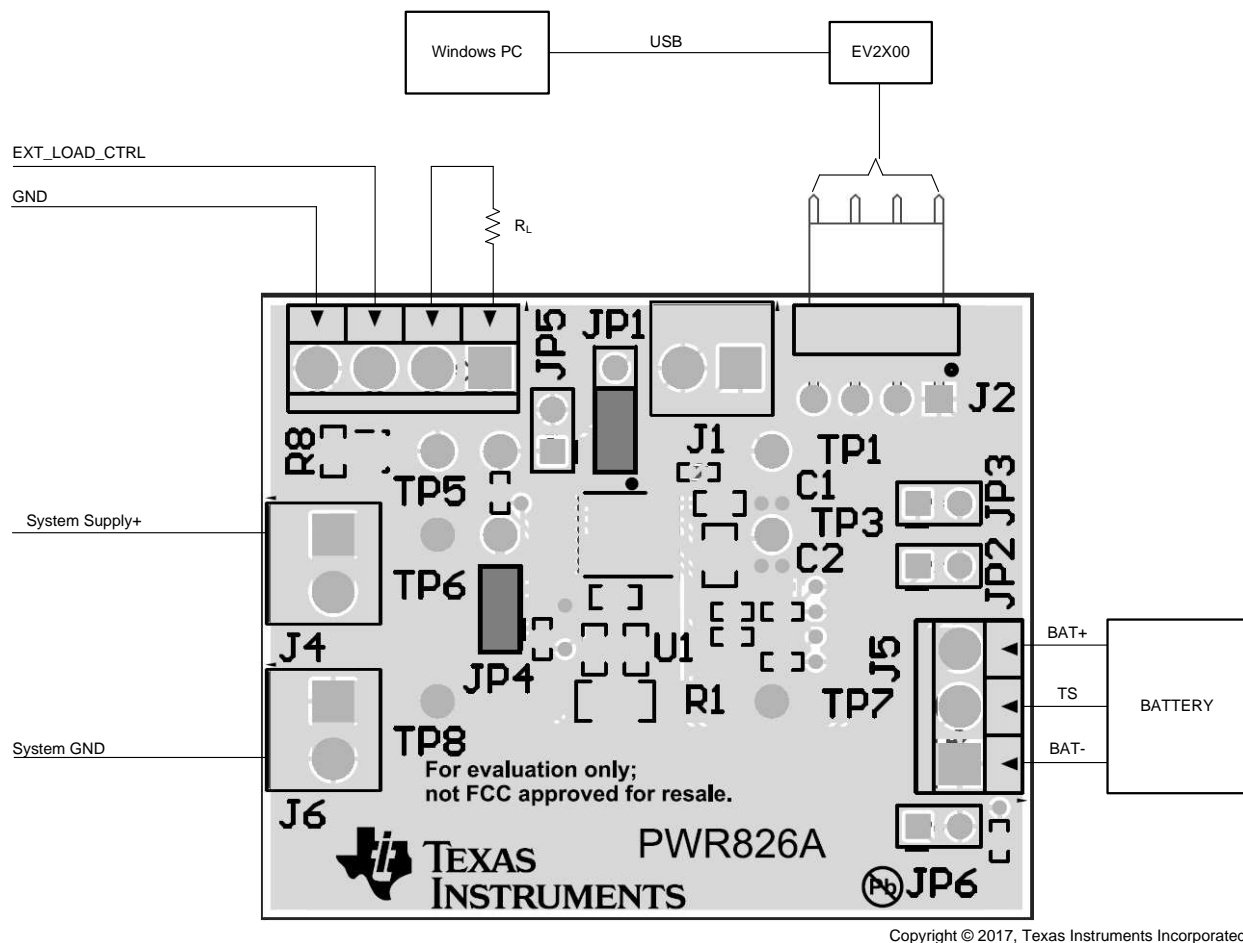


Figure 1. System Connections

## 2.3 Connector and Jumper Description

Table 2 and Table 3 list the connector and jumper descriptions, respectively.

**Table 2. Connector Descriptions**

Reference Designator	Description
J1	EXT_VCC
J2	Control interface (J2.1 GND, J2.2 SCL, J2.3 SDA, J2.4 external supply)
J3	External load control (J3.1 P+, J3.2 external load, J3.3 control, J3.4 GND)
J4	System Supply (P+)
J6	System Supply (P-)
J5	Battery connector (J5.1 BATTERY-, J5.2 Thermistor, J5.3 BATTERY+)

**Table 3. Jumper Descriptions**

Reference Designator	Description
JP1	EXT_VCC_SELECT (1-2 (default): P+, 2-3: External from J1)
JP2	10-k $\Omega$ pullup to EXT_VCC on SCL (default off)
JP3	10-k $\Omega$ pullup to EXT_VCC on SDA (default off)
JP4	5.1-k $\Omega$ pullup to EXT_VCC on ALERT (default on)
JP5	1.8-M $\Omega$ pulldown to GND on TS (default off)
JP6	Select onboard thermistor (default off)

After making the connections from Figure 1 and a verification of the default jumper settings, launch bqStudio to control and program the gauge.

### 3 Operation

#### 3.1 bqStudio

With the EV2300 or EV2400 and the bq34210 EVM connected to the computer, run bqStudio from the desktop or installation directory. The window consists of a tools panel at the top and other child windows that can be hidden, docked in various positions, or allowed to float as separate windows.

When bqStudio initially starts up, the *DashBoard*, the *Registers*, and *Commands* windows should be open (Figure 2).

Additional windows can be added by clicking the corresponding icons in the tools panel at the top of the main window.

Clicking the *Scan* (continuous scan) or *Refresh* (single time scan) buttons updates the data in the *Registers* and *Data Memory* windows. The logging function in bqStudio logs selected *Data Registers* last received from the bq34210. Enable this function by clicking the *Start Log* button.

The default elapsed interval is 4000 milliseconds. To change this interval, go to **Window**, select **Preferences**, choose **Registers**, and change the *Scan/Log Interval* from 4000 to 1000 milliseconds. There is no need to log faster than 1 second as the gauge will not update the registers faster than 1 second.

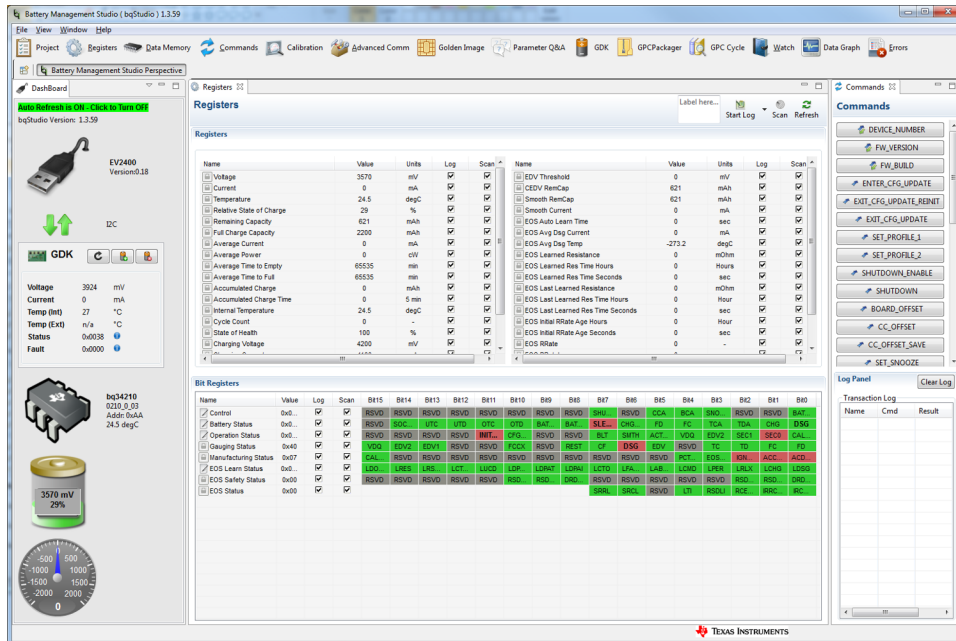


Figure 2. bqStudio Registers Window

### 3.2 Updating the Configuration

The bq34210 comes configured per the default settings detailed in the *bq34210-Q1 Technical Reference Manual (SLUUBE8)*. Ensure that the settings are correctly changed to match the pack and application for the bq34210 solution being evaluated.

**NOTE:** The correct setting of these options is essential for the best performance. Configure the settings using the *Data Memory* window (Figure 3).

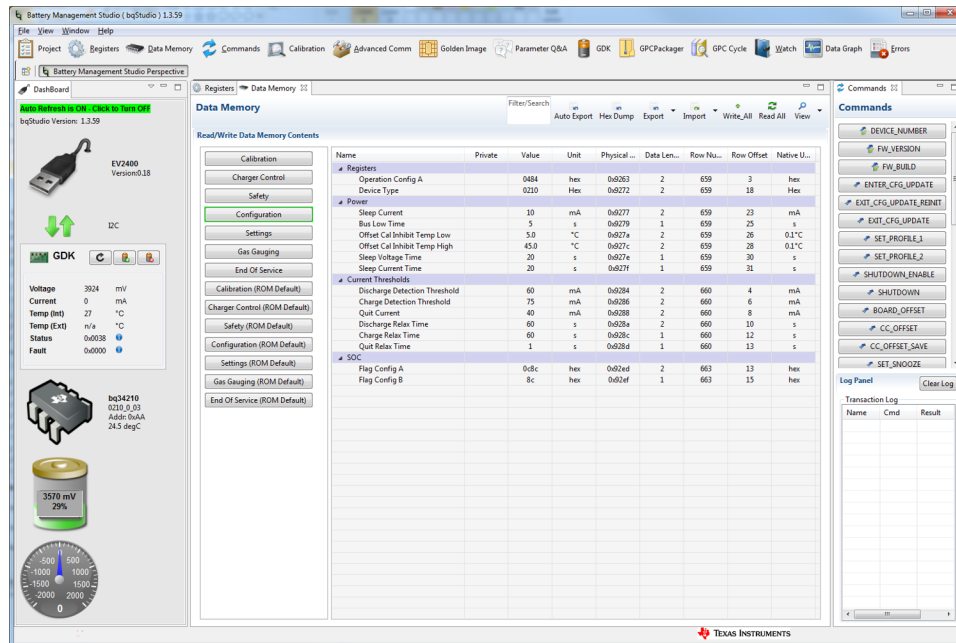


Figure 3. Data Memory Window

To read all the data from the bq34210 data memory, click on the *Read All* button on the *Data Memory* window. Make sure the device is not sealed and in full access to read and write to the data memory.

To update a parameter, double click on the value, change the value and hit enter.

Click the *Import* button in the *Data Memory* window to import an entire configuration from a \*.gg.csv file.

Save the configuration to a file by clicking the *Export* button in the *Data Memory* window and entering a file name. The configuration is saved to a \*.gg.csv file.



### 4.2 bq34210IQ1EVM-826 PCB Layout

Figure 5 through Figure 7 illustrate the EVM PCB layout images.

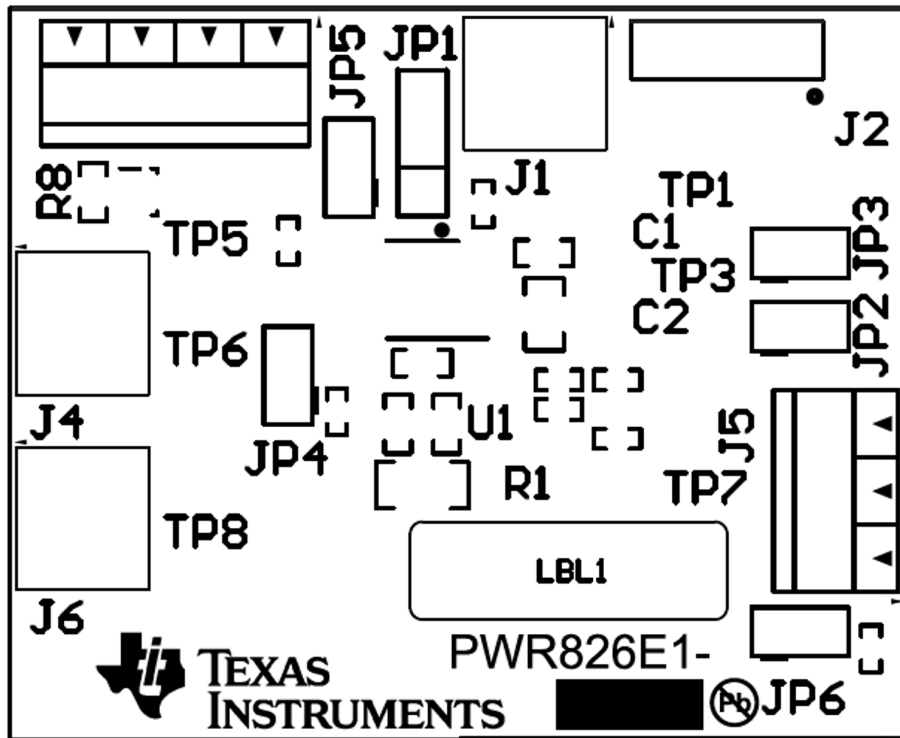


Figure 5. Components

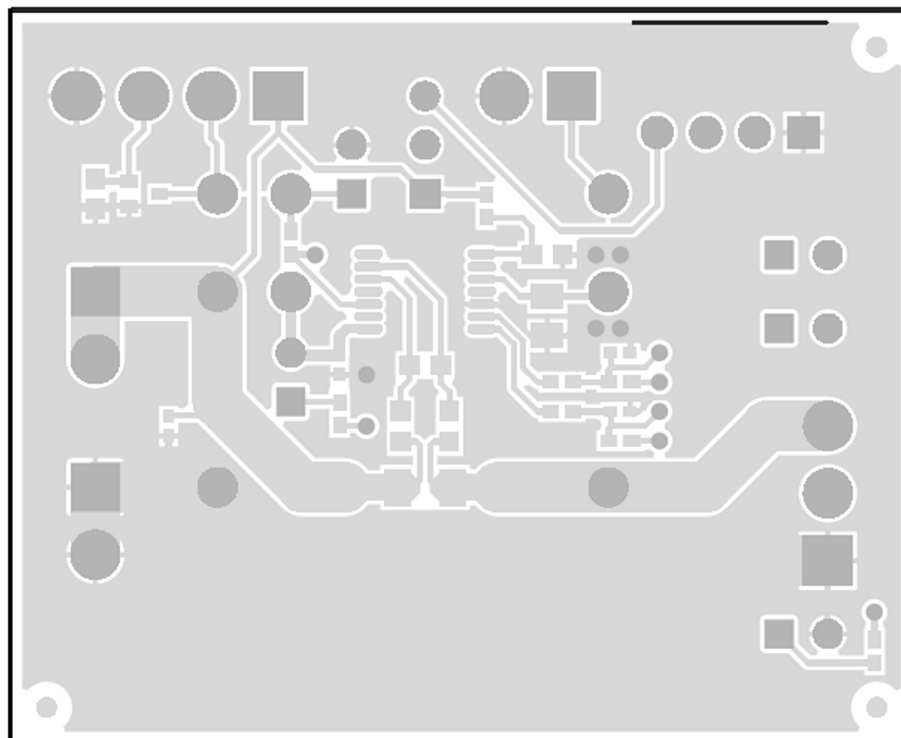
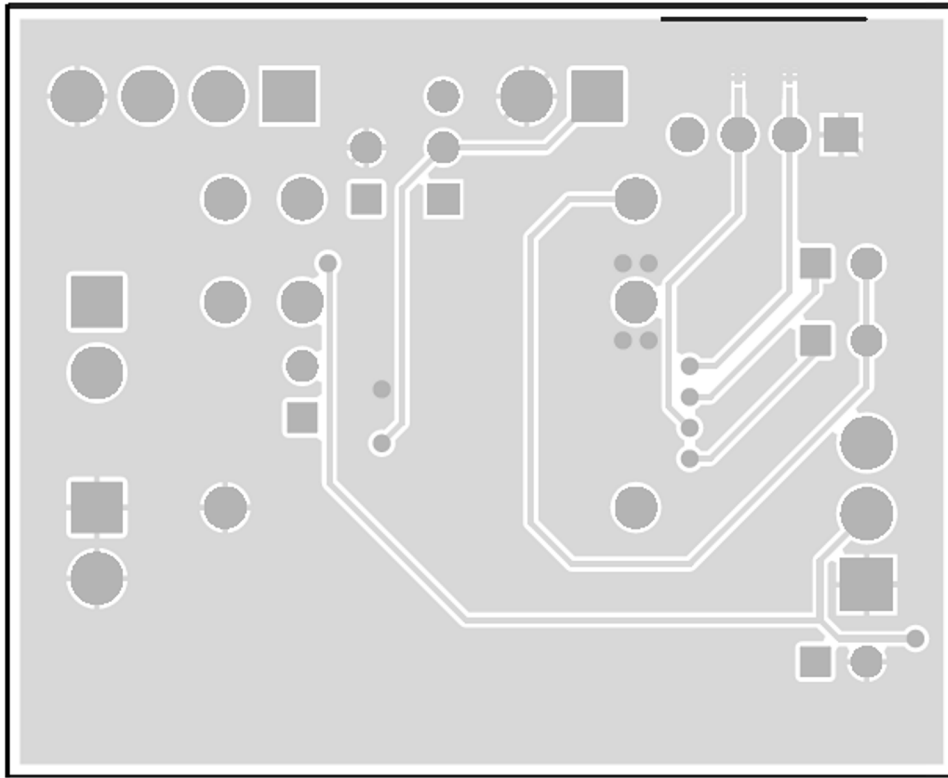


Figure 6. Top Layer





**Figure 7. Bottom Layer**

### 4.3 bq34210IQ1EVM-826 Bill of Materials

Table 4 lists the bq34210IQ1EVM-826 BOM.

**Table 4. Bill of Materials**

Designator	Description	Manufacturer	Part Number
C1	CAP, CERM, 1 $\mu$ F, 16 V, $\pm$ 20%, X5R, 0603	Wurth Elektronik	885012106017
C2	CAP, CERM, 2.2 $\mu$ F, 16 V, $\pm$ 10%, X5R, 0805	AVX	0805YD225KAT2A
C3	CAP, CERM, 0.1 $\mu$ F, 16 V, $\pm$ 10%, X7R, 0603	TDK	C1608X7R1C104K
J1, J4, J6	Terminal Block, 3.5mm Pitch, 2x1, TH	On-Shore Technology	ED555/2DS
J2	Header (friction lock), 100mil, 4x1, R/A, TH	Molex	22-05-3041
J3	Terminal Block, 3.5mm Pitch, 4x1, TH	On-Shore Technology	ED555/4DS
J5	Terminal Block, 3.5mm Pitch, 3x1, TH	On-Shore Technology	ED555/3DS
JP1	Header, 100mil, 3x1, Tin, TH	Sullins Connector Solutions	PEC03SAAN
JP2, JP3, JP4, JP5, JP6	Header, 100mil, 2x1, Tin, TH	Sullins Connector Solutions	PEC02SAAN
Q1	MOSFET, N-CH, 50 V, 0.2 A, SOT-323	Diodes Inc.	BSS138W-7-F
R1	RES, 0.01, 1%, 1 W, 1206	Vishay-Dale	WSLP1206R0100FEA
R2	RES, 10.0, 1%, 0.063 W, 0402	Vishay-Dale	CRCW040210R0FKED
R3, R4	RES, 10.0 k, 1%, 0.063 W, 0402	Vishay-Dale	CRCW040210K0FKED
R5, R6	RES, 100, 1%, 0.063 W, 0402	Vishay-Dale	CRCW0402100RFKED
R7	RES, 1.8 M, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04021M80JNED
R8	RES, 10.0 k, 1%, 0.1 W, 0603	Vishay-Dale	CRCW060310K0FKEA
R9, R10	RES, 100, 1%, 0.1 W, 0603	Vishay-Dale	CRCW0603100RFKEA
R11	RES, 5.1 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04025K10JNED
U1	System-Side CEDV Fuel Gauge, PW0014A	Texas Instruments	BQ34210IPWRQ1
U2, U3, U4, U5	ESD in 0402 Package with 10 pF Capacitance and 6 V Breakdown.	Texas Instruments	TPD1E10B06DPYR

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    - 3.1.2 *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

*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

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- 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 or RSS-247

#### Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. 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

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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##### 3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive):*

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
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