User's Guide

DRV8410_DRV8411_DRV8411AEVM User's Guide

TEXAS INSTRUMENTS

ABSTRACT

This document is provided with the DRV8410EVM, DRV8411EVM, and DRV8411AEVM evaluation modules (EVM) as a supplement to the DRV8410, DRV8411, DRV8411A datasheet. This user's guide details how to setup the EVM and install the included Graphical User Interface (GUI) program to control the motor driver.

Note
This is a pre-production evaluation module and can differ from the final production version.

CAUTION

Read the user's guide before use.

CAUTION

Caution hot surfaces.
Contact can cause burns.
Do not touch!

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Trademarks

All trademarks are the property of their respective owners.

1 Introduction

1.1 Overview

The DRV841xEVM is the evaluation module for the DRV8410, DRV8411, and DRV8411A family of low voltage dual h-bridge motor drivers capable of driving one stepper motor or two brushed DC motors. Please read the datasheet of each product to learn more about any of these drivers. There are a total of three EVMs which are DRV8410EVM, DRV8411EVM, and DRV8411AEVM. The DRV8410EVM and DRV8411EVM share the same hardware (MD062) but two different BOM variants. DRV8410EVM is MD062-001 and DRV8411EVM is MD062-002. The DRV8411AEVM is it's own board design (MD063) but shares many similarities with the MD062 board. In this user's manual, both of these boards will be discuss. Figure 1-1 and Figure 1-2 shows a 3D image of the MD062 and MD063 respectively.
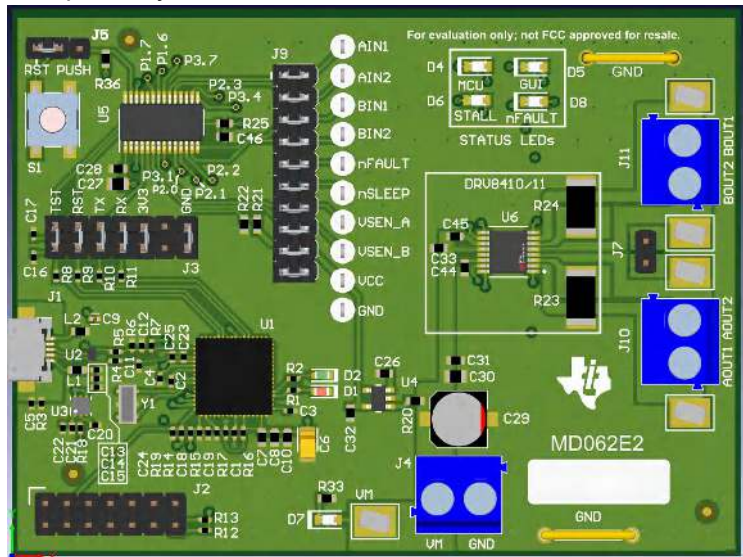

Figure 1-1. MD062 Board for DRV8410EVM and DRV8411EVM

Figure 1-2. MD063 Board for DRV8411AEVM

1.2 Features

The DRV841xEVM comes with various features for facilitating the validation of the DRV841x family of low voltage stepper motor drivers. Below is a list of the features included in this family of EVM:

• 3.3 V LDO for supplying power to digital circuitry.

> **Note**
>
> The DRV841x family of devices can operate as low as 1.65 V. If the power supply is less than 3.3 V, an external 3.3 V supply is required.

- Onboard eZ-FET lite circuit for MSP debugging. The eZ-FET lite allows for programming the MCU with a custom code via USB. No external hardware tool is required for programming. This eZ-FET lite circuit also facilitates updating of firmware when a new version of the firmware is available.
- Graphical User Interface (GUI) to control the driver input signals (nSLEEP, AIN1, IN2, BIN1, BIN2). More information regarding the GUI in Section 5.
- Main signal header with tests points and shunts to easily remove the signal connections between the driver IC and the MCU. User can connect external MCU to control the motor driver on the EVM. More details are shown in Section 2.
- Hardware is design so that the driver can be set to dual h-bridge and parallel h-bridge control by header jumper settings and GUI. The different control modes are explained in Section 5
- Test points for most important signals such as the control inputs, driver output, power supplies, LDO output, and so forth. for ease of measurement.
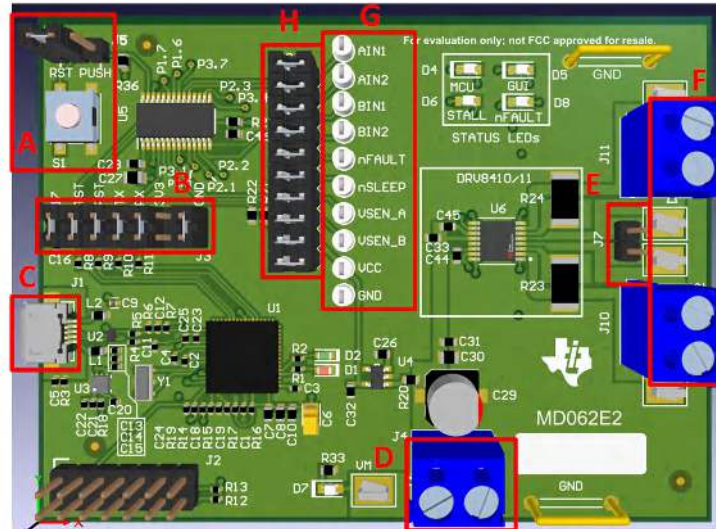
2 Connection Descriptions

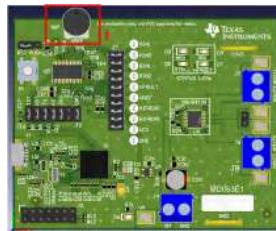**Figure 2-1. DRV8410EVM and DRV8411EVM Overview of Connectors and Test Points**

Figure 2-2. DRV8411AEVM Overview

Table 2-1. Test Points and Jumpers

Name	Description

A	• J5: Sets action of push button (S1)
	  – RST: MCU reset
	  – PUSH: Debug and testing purpose (NOT used in this EVM)
	• S1: Push button

B	• J3: Connector between eZ-FET-Lite and MSP430G2553 (U5)
C	• J1: Micro USB 2.0 connector
D	• J4: Main power connector
E	• J7: Connects AISEN and BISEN when operating in parallel h-bridge mode.
F	• J10: AOUT1 and AOUT2 connector • J11: BOUT1 and BOUT2 connector
G	• Test points for control input signals and other feedback signals going to the MCU (U5).
H	• J9: Header connecting signals from DRV and other feedback signals to the MCU. Remove the shunts in order to use an external signal or MCU.

Table 2-1. Test Points and Jumpers (continued)

Name	Description
I	• R27: Potentiometer for setting VREF voltage.

3 EVM Setup Guide

This section will provide a step-by-step guide for configuring and setting up the hardware before use. The DRV8410EVM and DRV8411EVM share the same board design but the DRV8411AEVM is slightly different than the other two boards. The hardware setup is the similar for the three boards unless it is specifically noted that it only applies to one board (the EVM name will be in paranthesis at the end of the step to note that the step only applies to that EVM).

3.1 Hardware Setup

1. The various headers have been populated with shunts on the default locations which are shown in Figure 1-1 and Figure 1-2. Confirm that the shunts are placed in the same location.
2. Connect micro USB included in the EVM kit to the EVM micro USB connector (J1).
3. Connect the other end of the UCB cable to the PC where the GUI has been installed. See Section 3.2 for GUI installation instructions.
4. Connect power supply to J4. The max power supply is limited by the max voltage specification of the device which is 12 V. Connect positive terminal to connector labeled "VM" and negative terminal to connector labeled "GND". Alternatively, the power supply can be connected with clip wires to the test points labeled "VM" and "GND" located on either side of the screw connector (J4).
5. At this point, the board is alive with D1 ON and D4 (MCU) blinking. **If D4 LED is OFF or not blinking, press on the RESET button S1 to manually reset the MCU.**
6. Set the potentiometer R27 to set desired VREF voltage. The VREF test point can be probed with voltage meter to mesure the VREF voltage. The VREF voltage sets the current regulation limit. Read the DRV8411A data sheet for the current regulation (ITRIP) limit equation. If no current regulation is needed, set the VREF to 3.3 V. (This step only applies for the DRV8411AEVM).
7. Now the EVM is ready to be connected to the GUI. Follow the steps in next section for instructions on GUI installation.

3.2 GUI Installation

1. Go to dev.ti.com/gallery and search for **DRV841xEVM-GUI** to use the web based GUI or to download the GUI and install locally to the computer. Note that to use the web based GUI, the TICloudAgent Bridge browser extension is required to be installed. Special permissions from your company's firewall may be required to install this addon. For better performance, use a Chrome based browser.
2. After clicking the link above, there is the option of using the GUI on the web browser or download the installer to run the GUI locally. Clicking the empty space above the title "DRV841xEVM-GUI" will open the GUI on a different tab. Hovering the mouse over the ⬇ icon will display a pop-up window to download the installer for the PC platform (Linux, Mac, or Windows). Optionally, the GUI composer runtime can be downloaded here or during the installation of the GUI. The preferred method is to install the GUI composer runtime during the GUI installation.

Click here to use web based GUI. Will ask to install the TICloudAgent Bridge Addon to use
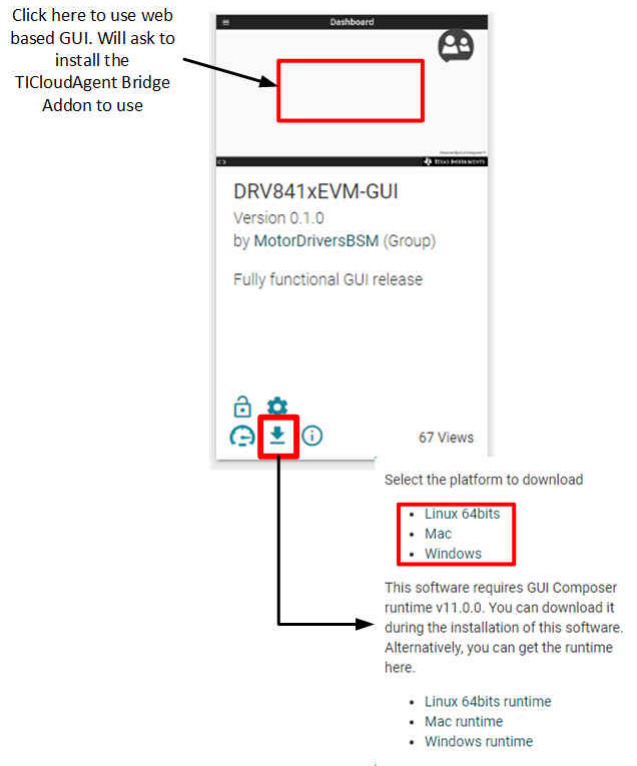
a.

Figure 3-1. GUI on dev.ti.com

3. Open, extract the ZIP folder, and double click on the .exe to run the installer. The following window will appear. Click on "Next" to continue.
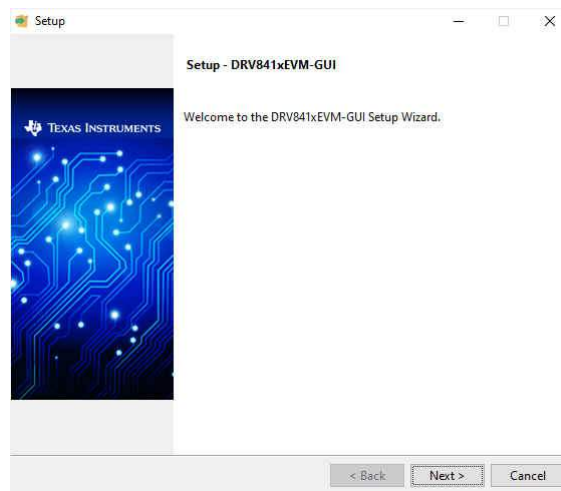
a.

Figure 3-2. GUI Installer Start Window

4. Read and accept the license agreement. Click "Next".
5. Keep the Application and Runtime directories to default locations. Click "Next" to install the GUI.
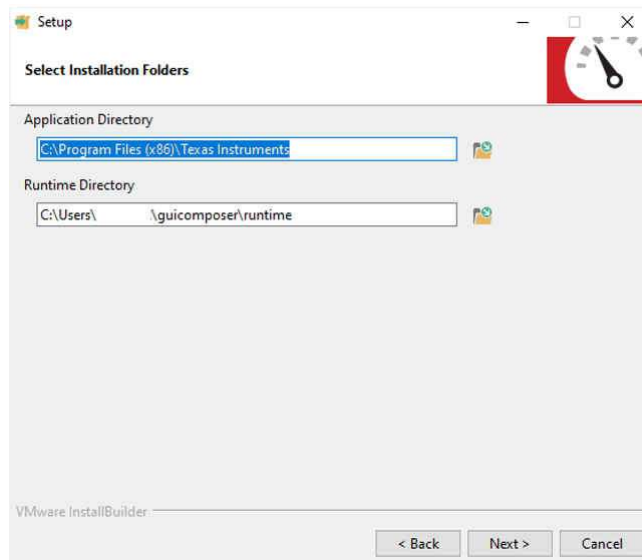
a.

Figure 3-3. Default GUI and Runtime Install Location

6. After successful installing the GUI. The following window will appear. Check the "Create Desktop Shortcut" box to save a shortcut to the desktop. Otherwise, the GUI executable is found on the application directory from step 5.
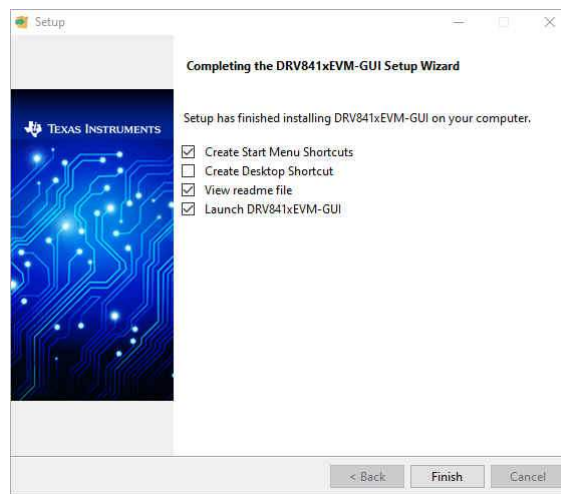
a.

Figure 3-4. Window After Sucessful Installation

7. Now the GUI has been successfully installed. Section 4 provides an overview of the GUI and how to use it.

4 GUI Overview

The DRV841xEVM-GUI is design to support the DRV8410EVM, DRV8411EVM, and DRV8411AEVM. Figure 4-1 shows the home page. The GUI variant can either be DRV8410, DRV8411, or DRV8411A depending on the EVM connected. The EVM will not connect to the GUI if the wrong variant is selected.
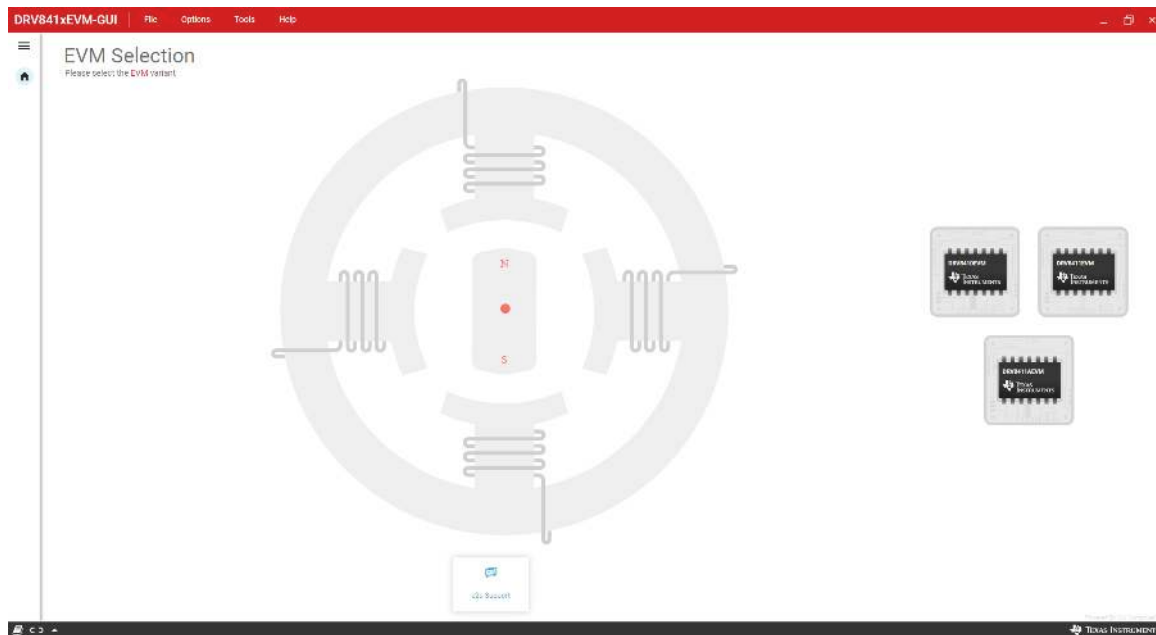
Figure 4-1. DRV841xEVM GUI Home Page

To update the EVM firmware, click on "Program Device" under the "File" tab as shown in Figure 4-2. **Before using the EVM, please update the firmware since newer versions of the GUI may not be compatible with older EVM firmware versions**.
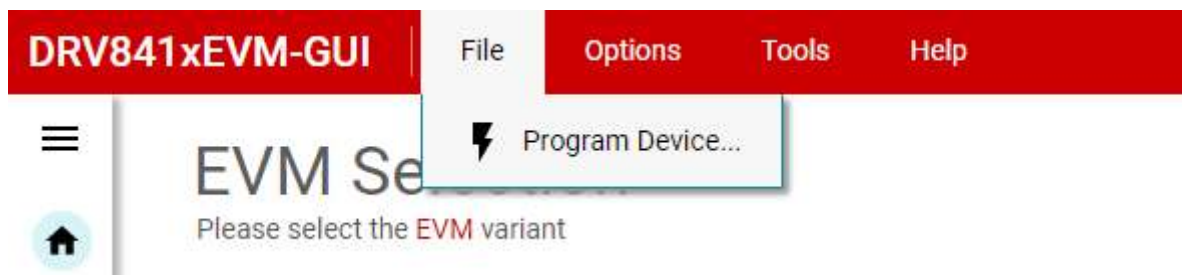
Figure 4-2. Program Device

Figure 4-3 shows the control page of the DRV8410 and DRV8411 GUI variants. The section labeled "A" displays the Firmware Version. The firmware version is a non-zero value that corresponds to the connected EVM version. Section "B" enables/disables the motor driver. Certain widgets in the GUI are not available when motor is disabled for safety purposes. Section "C" is for selecting the motor type connected to the motor output.
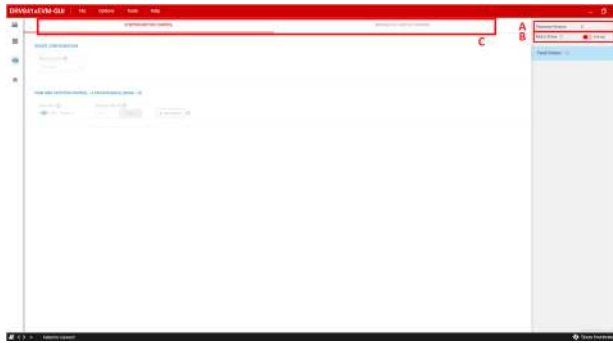
Figure 4-3. DRV8410 and DRV8411 Motor Control Page

5 Operating Modes

5.1 Stepper Motor

The DRV841x family of devices can drive a stepper motor or two brushed DC motors. Choosing the "Stepper Motor Control" tab in the GUI displays the stepper control GUI page. Figure 5-1 displays the stepper control page. Hovering over the "!" icons display information about each widget. The "Mode Option" selects between full step and half-step. Choosing half step will display another widget titled "Decay Mode" which sets th decay mode. The "Direction" arrows sets the motor spin direction. The "Stepper Speed" sets the motor speed in pps (pulses per second). Finally, the "Start Motor" button will spin the motor.
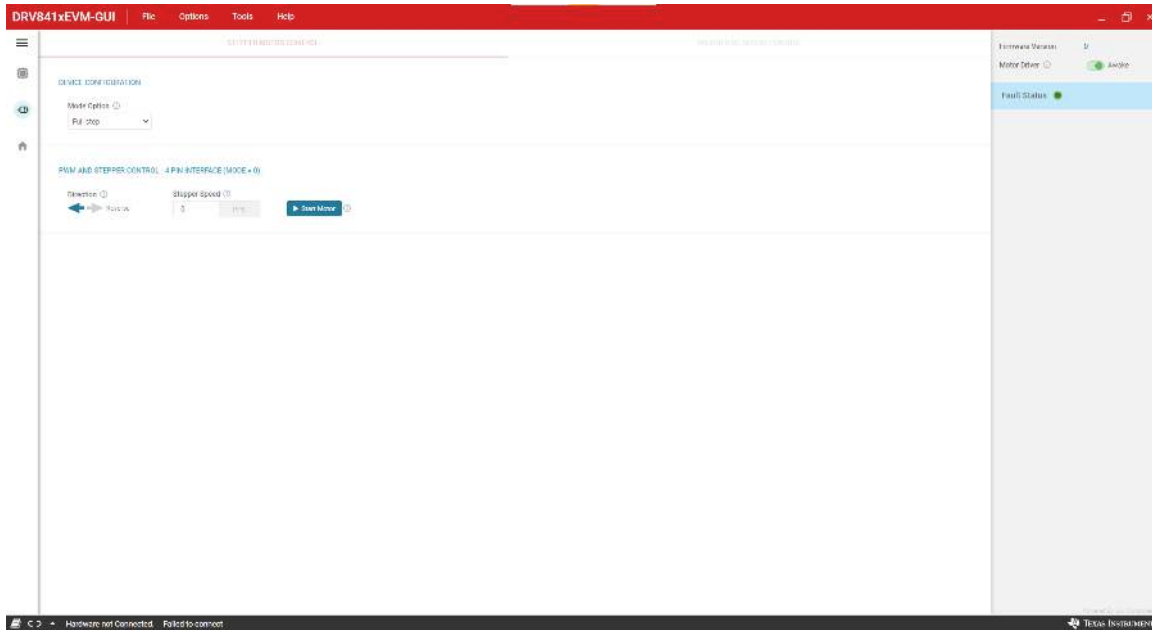
Figure 5-1. Stepper Motor Control Page

5.2 Brushed DC Motor

The brushed DC control page allows to configure between parallel h-bridge (AIN1-BIN1 duty cycle controlled by AIN1 slider and AIN2-BIN2 controlled by AIN2 slider) and dual h-bridge (each control input signal controller by an individual slider). The PWM switching frequency can be set between 20kHz, 10kHz, 5kHz, and 2.5kHz. The user has the ability to use external custom PWM signals for AIN1, AIN2, BIN1, and BIN2 by connecting external signal to the respective test points and removing the appropiate shunt on J9 header.

Note

In parallel h-bridge mode, ensure that J7 header is shorted to connect the SENSE resistor of both h-bridges

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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.

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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:

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- *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*

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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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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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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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4.2   User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

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