DRV8844 Evaluation Module

This document is provided as a supplement to the DRV8844 datasheet (SLVSBA2). It details the hardware implementation of the DRV8844EVM customer evaluation module (EVM).

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1 Introduction

The DRV8844 customer evaluation module (EVM) is a platform revolving around the DRV8844, a medium voltage, quadruple half-H-bridge driver. This device is designed to drive four independent inductive or resistive loads, such as solenoids, relays, or lamps. The EVM can also drive two brushed DC motors or either a unipolar or a bipolar stepper motor not requiring integrated current regulation.

The EVM houses an MSP430 microcontroller and a USB interface chip. The USB chip allows for serial communications from a PC computer where a Windows® application schedules serial commands. These commands can control each of the device's signals, or control both devices at the same time to drive a stepper motor.

The microcontroller firmware offers the generation of all the control signals often employed to enable or disable the power stage and four PWM's to articulate each power output with a configurable duty cycle.

This users guide details the operation of the EVM, as well as the hardware configurability of the evaluation module.

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2 Block Diagram

Figure 1 shows the DRV8844 block diagram.

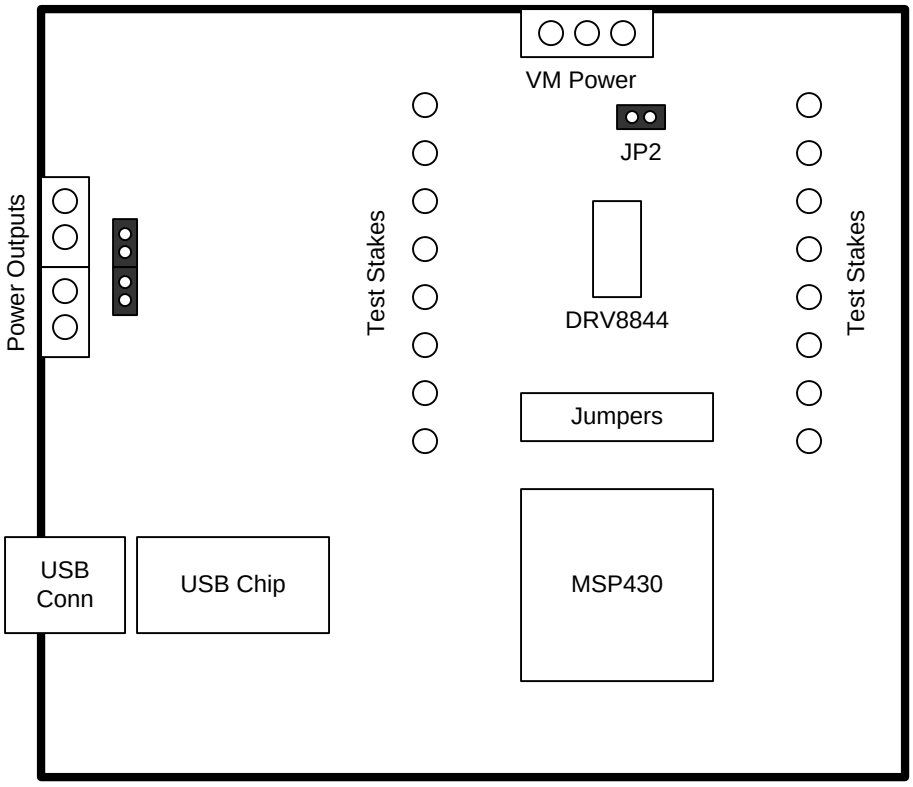


Figure 1. DRV8844 Block Diagram

2.1 Power Connectors

This EVM offers access to the Motor Voltage (VM) power rail via a terminal block (J3). A set of test clips in parallel with the terminal block allows monitoring of the input power rail.

Since the DRV8844 can be utilized with either split power supplies (+VM/-VM) or with a single power supply (+VM), jumper JP2 allows the LGND and –VM nodes to be connected together when using the single power-supply implementation.

The VM must be applied according to the parameters recommended in the DRV8844 datasheet (SLVSBA2).

2.2 Test Stakes

Test stakes surrounding the DRV8844 allow access to monitoring all control and output signals.

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2.3 Jumpers

The EVM contains one row of ten 2-pin jumpers (JP3), which are removable to isolate the microcontroller resource as a controlling source to the power stage. If a particular signal is interfaced externally, attach the controlling signal to either the test stakes or the driver side of JP3.

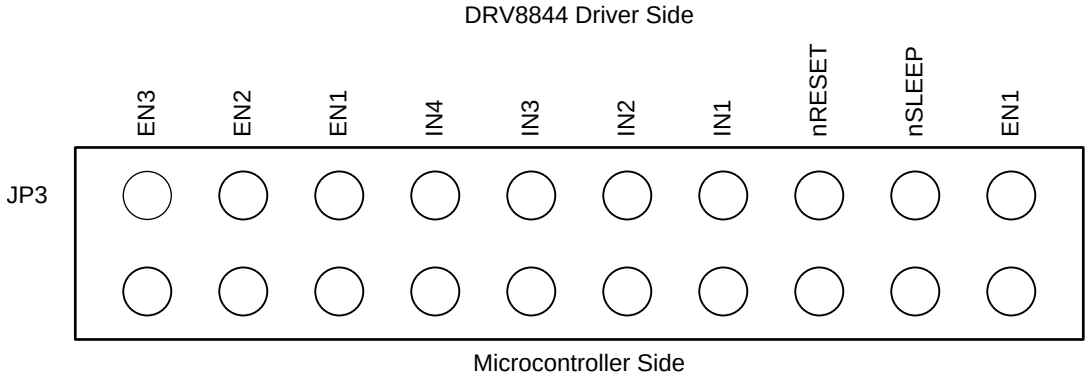


Figure 2. DRV8844 Jumpers

2.4 Power Outputs

There are two ways of connecting the desired load into the EVM: four pin header (J1) or four position terminal block (J2).

3 Installing Drivers and Software

3.1 Installing the FTDI USB Driver

The USB driver is easily installed on any Windows system (Windows XP 32 or 64 bits, Windows Vista, Windows 7) by double-clicking the included *CDM20814_Setup.exe*. The USB peripheral is installed as a virtual COM port (VCP). The Windows application enumerates all available COM Ports during startup. While connecting, the application attempts to communicate with the module. Once communications have been successfully established, the EVM is ready for evaluation purposes.

3.2 Installing the DRV8844 Evaluation Board Windows Application Software

The Windows application is installed by running the *Setup.exe* file found in the DRV8844 folder.

3.3 Running the Windows Application Software

Start this application by clicking Start → Programs → Texas Instruments Inc. → DRV8844EVM.

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4 Windows Application

The DRV8844EVM Windows application is the software counterpart for the DRV8844 EVM allowing the connection of a PC to the MSP430F2617 microcontroller though a USB interface chip. Once connection is established and commands are sent, the microcontroller takes care of configuring control signals and PWM generation.

The Graphical User Interface (GUI) is designed for testing all of the DRV8844 device's functionality without requiring hardware changes.

Figure 3 shows the DRV8844EVM.exe main screen.

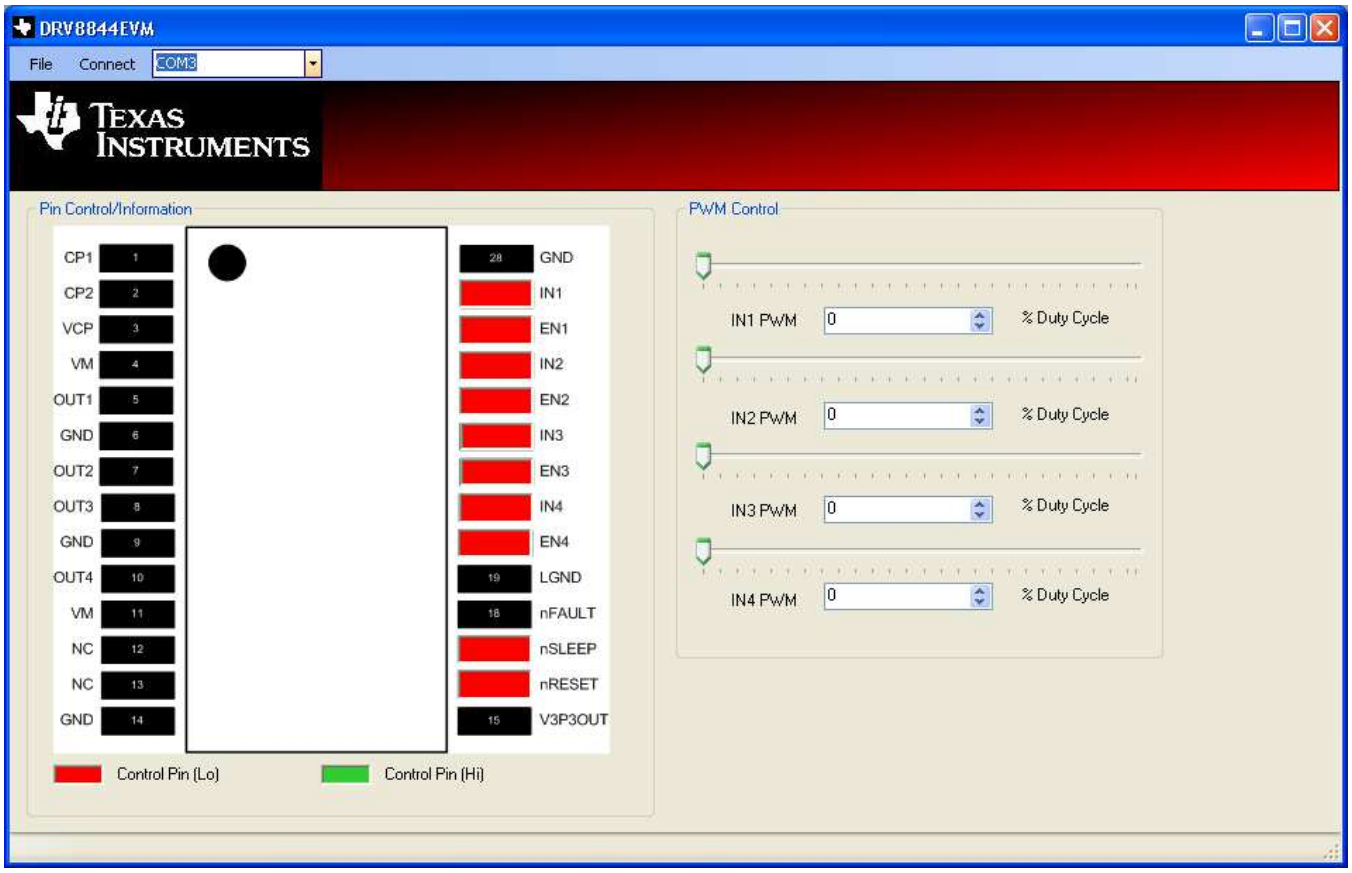


Figure 3. DRV8844EVM.exe Main Screen

All the control signals needed to manage the power outputs enablement/disablement (ENx), power output polarity selection (INx), device sleep mode (nSLEEP), and reset mode (nRESET) are made available throughout pictographic pins at the *Pin Control/Information* frame. Sliders at the PWM control frame allow for each respective output's PWM duty cycle to be dynamically modified.

4.1 Menu

The menu at the top of the application offers a series of quick options for behavior of the COM port.

File: Exit – Terminates the Application

Connect: Opens the Serial Port. When this menu item is pressed, its caption changes to *Disconnect*

Disconnect: Closes the Serial Port. When this menu item is pressed, its caption changes to *Connect*

COMx: A series of available COM ports is shown. To determine which COM port is the VCP, view the Windows' Device Manager and determine which one of the enumerated COM ports is using the FTDI driver.

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After opening the application, the order of events should be:

1. Select the COM port from the COMx drop-down box.
2. Press Connect. If COM ports are available, the application searches for the EVM. If no EVM is found, an error message notifies the user. If the port is available and communications are successfully made, the menu item changes its *Connect* caption to *Disconnect*. Pressing *Disconnect* to disables the serial communications.
3. After pressing any command button, <1><0><0> should return on the bottom status bar as an acknowledgment of proper communications taking place with the board.
4. The application is now ready for use.
5. Closing down the application (through the Close X or through File → Exit) closes the serial port connection, it is not necessary to press *Disconnect* before closing down the application.

4.2 DRV8844 GPIO Control Signals

Once the application is communicating with the interface board, the control signals can be actuated by clicking on the respective pin. A signal with a logic LO state is represented with the color red, whereas the same signal is represented with the color green once its state is switched to logic HI.

4.3 PWM Control

The four INx signals are actuated through a series of PWM outputs generated by the onboard MSP430 microcontroller. The PWM duty cycle is programmed by either moving the respective slider or changing the duty cycle percentage on the number box, see Figure 4.

When engaging the PWM sliders, the output enters PWM mode. The respective ENx pin turns from either green or red, to orange, depicting a PWM-based output. Pressing the orange pin button again takes the same output to 100% duty cycle, while the orange pin changes to a green color. Whenever the PWM sliders are moved to the 0% or 100% position, the respective pin changes to a red or green color respectively. That is, for each ENx pin, red stands for 0% duty cycle (or channel off), whereas green stands for 100% duty cycle (or channel full on).

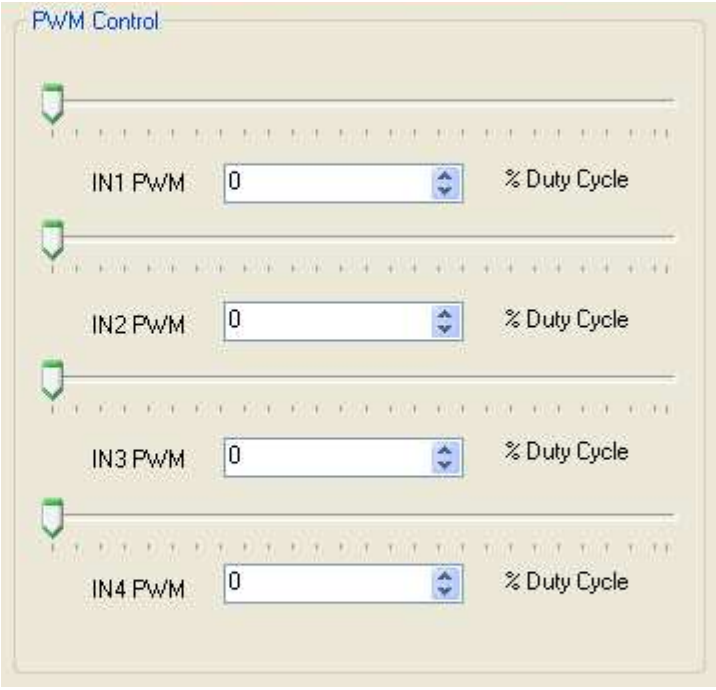


Figure 4. DRV8844 PWM Control Window

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5 Schematic

The schematic is available in PDF form (*SCH.pdf*) inside the **EVM_Related** folder on the downloadable EVM software package.

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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.

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

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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.

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