

ABSTRACT

This document is the user's manual for the DRV8845 and DRV8849 evaluation module (EVM) and the GUI to control the EVM. The DRV8845EVM allows for control and evaluation of the DRV8845 which is a dual stepper or four brushed motors driver. The DRV8849EVM allows for the evaluation of DRV8849 which is dual stepper driver. This manual provides a detailed overview of the hardware features and how to use the included GUI to control the both DRV8845EVM and DRV8849 EVM.

CAUTION

Hot surfaces on the EVM include the driver device (U5) and the area surrounding it. When operating the EVM at the maximum device specifications and a high ambient temperature, external cooling fans may be required to minimize potential fire hazard, personal injury, or both.

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Trademarks

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1 Introduction

1.1 DRV8845 Quad H-bridge motor driver

The DRV8845 is a quad full-bridge driver for a wide variety of industrial applications. The device can be used for driving up to two stepper motors or up to four brushed-DC motors. Each full-bridge output is rated up to 1.5 A and 38 V. The DRV8845 includes pulse width modulation (PWM) current regulators, along with 2-bit nonlinear DACs (digital-to-analog converters) that allow stepper motors to be controlled in full, half, and quarter steps; and DC motors in forward, reverse, and coast modes.

This driver offers Smart tune decay mode for smooth and quiet operation. Protection features in this driver include thermal shutdown with hysteresis (OTSD), undervoltage lockout (UVLO) and overcurrent protection (OCP).

1.2 DRV8849 Dual Stepper driver

The DRV8849 is a dual stepper motor driver for industrial and consumer applications. The device is fully integrated with four N-channel power MOSFET H-bridge drivers, one microstepping indexer for each stepper, and integrated current sensing. The DRV8849 is capable of driving up to 1.5-A (limited by board design). The DRV8849 uses STEP/DIR interface to control the direction and step rate of the stepper motor.

Protection features are provided for supply undervoltage, charge pump faults, overcurrent, short circuits, and overtemperature.

2 Jumpers Table and Setup

The jumpers for the DRV8845EVM [Figure 2-1](#) and DRV8849EVM [Figure 2-2](#) are identical except for J5 and J13 and the below figures can be referred to for proper connection.

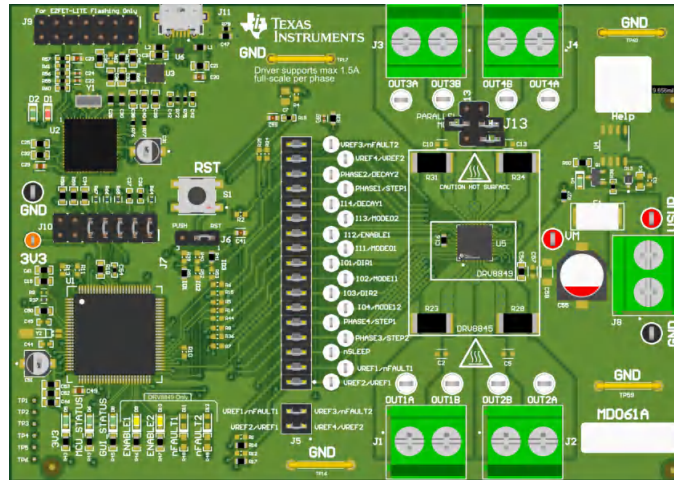


Figure 2-1. DRV8845EVM Jumper Population Guide

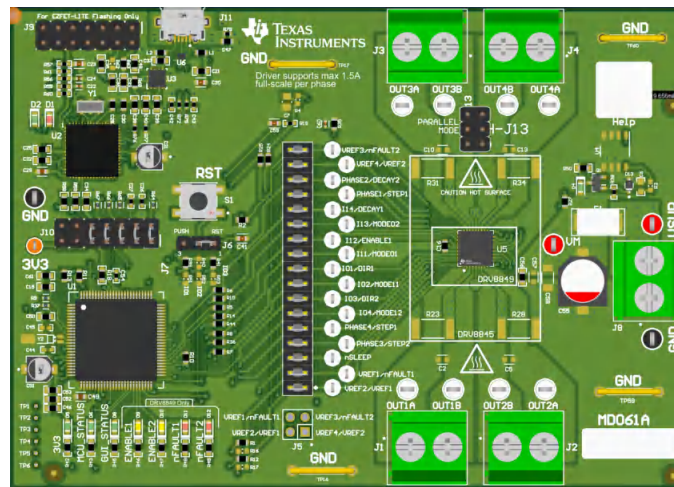


Figure 2-2. DRV8849EVM Jumper Population Guide

Table 2-1. Jumper Identification Table

Jumpers	DRV8845EVM/DRV8849EVM
J1-J4	OUT1A, OUT1B – OUT4A, OUT4B
J5	Connect VREF1 with VREF 3 and VREF2 with VREF4 for DRV8845EVM Leave unconnected for DRV8849EVM
J6	Push button to reset MCU
J7	MCU to DRV signals
J8	VM
J10	EZ FET communication jumpers
J11	Micro USB connection
J13	Jumpers for parallel drive

Note that the labels for Jumpers J5 and J7 are separated with a “/” where the left label corresponds to DRV8845 and the right one corresponds to DRV8849.

For more detailed information download the hardware files and schematics. Once you have verified that all shunts and jumpers are in the correct location you can move on to hardware setup.

3 Software Setup

1. Install the TI MSP430 USB driver from [MSP430 FET Drivers](#).
 - a. Click on the driver download link highlighted in the image below.
 - b. Please login with your myTI credentials when prompted and provide the requested information. The approval to access the download is automatic and immediate as long as the U.S. Government export approval requirements are complied with

MSP430_FET_Drivers Product downloads





Title	Description	Size
 ti_msp430driver_setup_1.0.1.1-windows.zip	Windows Installer	15108K
 ti_msp430driver_setup_1.0.1.1-linux.zip	Linux 32-Bit Installer	4504K
 ti_msp430driver_setup_1.0.1.1-linux64.zip	Linux 64-Bit Installer	4504K
 ti_msp430driver_setup_1.0.1.1.app.zip	macOS Installer	10856K
md5sum.txt	MD5 Checksums	4K
MSP Flasher User's Guide		

Figure 3-1. FET Drivers Product Download List

- c. Click on the download button to download the installer to your PC.
- d. Double click on the downloaded zip file and run the installer by double clicking on the “.exe” file.
 - i. Complete the installation.
 - ii. The required USB drivers to use the EVM are installed in your PC.
 - iii. Please follow proper safety precautions working with sensitive electronics as well as high voltage and high current hardware.
 - iv. Power sequencing: The USB cable must be plugged in first between the EVM and the computer. Then turn on the power supply to the EVM. Powering the EVM external bench supply before connecting the USB cable can cause the USB device to not start up properly and result with driver error.
 - v. Setup the bench supply to 12 V with current limit set to appropriate requirements of the motor.
 - vi. The computer then recognizes the USB device is connected and enumerates as serial ports in the system as shown below. The COMxx numbers can vary according to your system.
 - vii. Login to <https://dev.ti.com/gallery/> using your myTI login credentials. Please note the GUI composer login looks for a very specific username match including case input at the time of sign up.

4 Cloud-based GUI

1. Search for “DRV884xEVM-GUI”.
2. When presented with the list of available GUIs, launch the latest version by clicking in the white space of the tile anywhere in the white space of the tile that belongs to the latest version. The version 1.0.0 can be ran using this link [DRV884x-EVM-GUI](#).



Figure 4-1. TI GUI Composer Results for Launching or Downloading Local Installer

5 Local Installation

Follow these instructions for downloading and installing the latest version of the EVM GUI application:

1. The EVM GUI application installer can be downloaded from the TI GUI Composer Gallery by clicking on the download icon indicated by a red arrow in the [Figure 4-1](#) above.
2. From the gallery, click the download icon in the latest version and select the installer for your operating system (Windows, Linux or Mac).
3. Unzip the downloaded .zip file.
4. From the unzipped folder, run the GUI installer (.exe file with the current version.) If you have not installed the GUI Composer Runtime, the installer will take care of this for you. The installer contents may look slightly different for each OS, but should be self-explanatory.
5. You are now ready to run the GUI application on your local machine after completing the hardware setup in the next section.

6 Hardware Setup

1. Connect the USB cable to J11 of the EVM and a computer.
2. If using a stepper motor connect A-phase to J1 screw terminal connector and B-phase to J2 connector. Repeat the connection using a second stepper motor on J1 and J2 if you wish to spin two stepper motors. (Note: J1, J2 are Stepper 1 outputs and J3, J4 are Stepper 2 outputs).
3. On DRV8845EVM you can spin up to 4 brushed DC motors using connectors J1-J4.

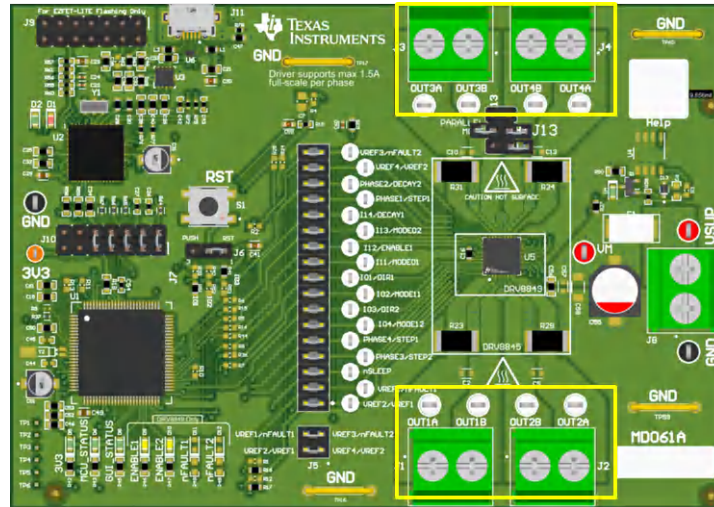


Figure 6-1. DRV8845EVM motor connectors

4. Observing correct polarity connect the VM power supply to the large screw terminal block J8. In J8 the left side is positive and right side is GND.

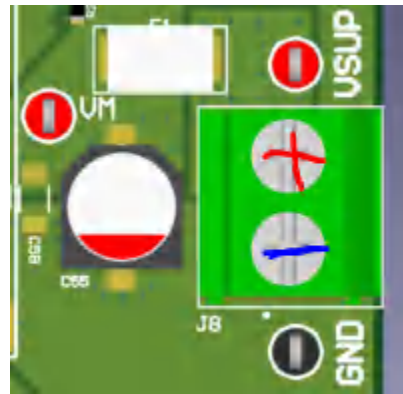


Figure 6-2. VM power connector

5. Verify that the EZFET LED D2, 3V3 LED D5 and are illuminated and that the MCU_STATUS LED D6 is blinking at approximately 1Hz. If the STATUS LED is not blinking perform a firmware reset using the push button S1 with jumper J6 in 1-2 RST position.
6. The MCU_STATUS LED D6 blinks now if the EVM hardware is functioning normally.
7. The EVM is ready to be used with the GUI application. In certain situations, such as while disconnecting and reconnecting VM power before the power supply capacitors are fully discharged a proper firmware reset can fail to happen. A proper reset is indicated by the STATUS LED D6 blinking at a rate of approximately 1 Hz. If the Status LED is not blinking as expected, press the reset push button once with jumper J6 installed in the RST position.
8. Do not unplug the USB cable while the VM power is active. If you do, switch off the VM power, wait until the VM power is fully discharged and proceed to step 2.
9. The latest version of the GUI application is bundled with the latest version of the EVM firmware.

A firmware update is suggested before selecting and connecting to an EVM variant using the GUI application. The firmware update procedure is described in the [updating firmware](#) section of this User's Guide.

7 Launching the DRV884x-EVM-GUI Application

Whether using the desktop or web version of the GUI, the user experience and steps covered below is the same. These steps assume the hardware setup steps in the previous section have already been completed.

1. Launch the GUI application using Chrome web browser or from your local desktop installation. Note you'll have to log-in to the [TI Dev Gallery](#) using your myTI log-in credentials prior to launching the app while running from a web browser.
 - a. Hyperlink for running app in Chrome: [Web GUI](#)
2. Select the desired EVM type from the screen referenced in the [Figure 7-1](#) below

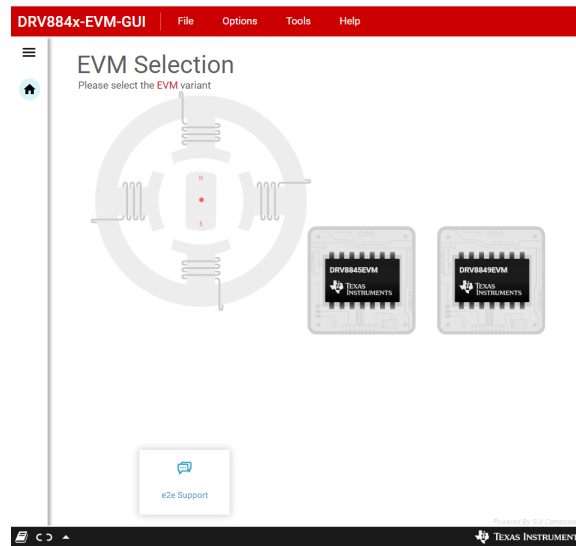


Figure 7-1. DRV884x-EVM GUI Home Screen

3. After clicking the correct EVM type, the GUI application initiates communications with the EVM. Connection confirmation is displayed as shown below:

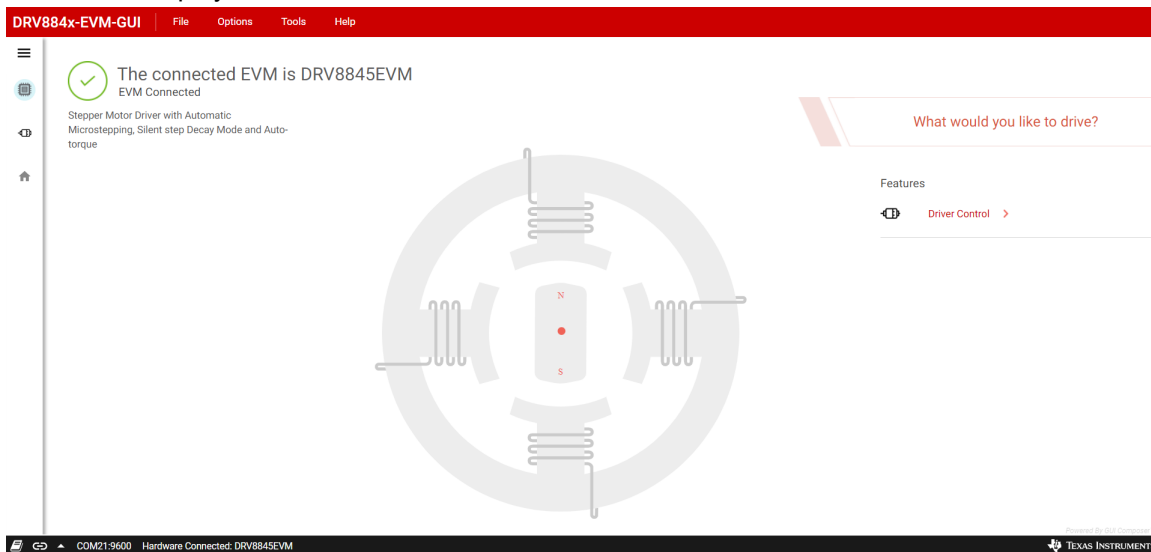


Figure 7-2. Successful EVM Connection

4. If the GUI app Driver connection with the EVM is repeatedly not successful, follow the below listed steps to debug the issue.
 - a. Check if the serial communications parameters were properly configured. In the GUI, click on the “Options” menu, and select “Serial Port”. Verify if the port selected matches the MSP Application UART1 enumerated in the Device Manager, Windows system Control Panel. The baud rate must be set to 9600 (recommended). If no MSP COMxx ports were enumerated and displayed in the Windows Device Manager, ensure proper power sequencing was followed. If necessary do a power off and on cycle. If

the following Windows Device Manager information is still not visible after the power cycle it points to a hardware connection issue.

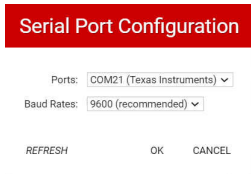


Figure 7-3. Serial Port Configuration

- b. It is possible that the EVM has a much older version of the firmware. Perform a firmware update using the procedure described in [Updating Firmware](#).
 - c. Check if the MCU_STATUS LED D6 is blinking at approximately 1 Hz. If the STATUS LED is not blinking, perform a firmware reset using the push button S1 with jumper J6 in 1-2 RST position. Attempt to connect the GUI app with the EVM again.
5. At this point, the user may set-up the EVM for device evaluation
- Driver Control page with configuration and diagnostic options.
 - GUI Home page to re-select the EVM if necessary.

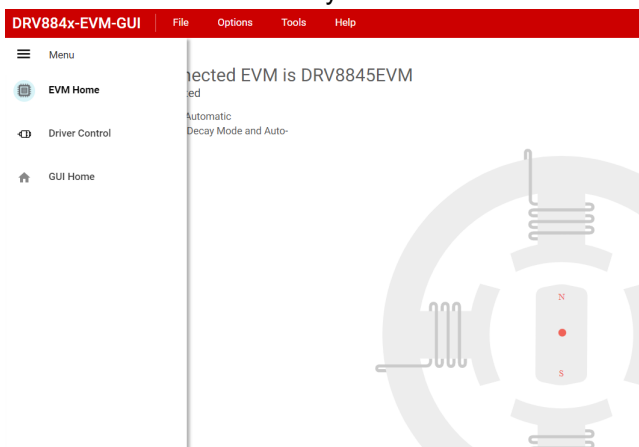


Figure 7-4. DRV884x-EVM GUI Navigation

6. The "Driver Control" tab will display the firmware version in the top right corner. When you click on "Help > About" it should display the GUI version, Device Rev ID, and the EVM firmware version.

8 GUI Operations DRV8845

Note

The MSP430 microcontroller used in DRV8845EVM only has two onboard DACs. DAC0 provides microstepping reference voltages VREF1 and VREF3 simultaneously and DAC1 provides microstepping reference voltages VREF2 and VREF4 simultaneously. Because of this limitation while running both stepper motors they will run with the same setting parameters. To run two stepper motors simultaneously with independent control settings, remove the jumper shorts for the required signal inputs and provide control inputs from an external source such as an application microcontroller.

1. Go to the “Driver Control” tab.
2. Stepper Motor Control
 - a. Select “Stepper Motor Control”.
 - b. Set the “Motor Driver” to “Awake” and the required stepper driver outputs to “Enabled”
 - c. Select the desired “Control Mode” – This is a GUI app feature which allows selection between “Speed” mode and “Step” mode. In speed mode the motor can run at the set target speed using the defined acceleration and deceleration rate motion profile. In “Step” mode the motor can be stepped to the desired position by setting the required number of steps at the set target speed.
 - d. Spinning Two Stepper motors:
 - i. Enable Stepper 1 Outputs, then Stepper 2 Outputs. Notice that Stepper 1 Outputs Enabled is greyed out and the Stepper 2 motor controls is greyed out.
 - ii. Now Stepper 1 Controls is used to control both motors.
 - iii. Please note that if you start by enabling Stepper 2 Outputs then you are not able to spin two motors.
 - e. Features:
 - i. Step Mode: Can be used to set the microstepping mode
 - ii. Full Scale Current: Can be used to set the full scale current value
 - iii. Starting Speed: The speed at which the motor starts spinning
 - iv. Target Speed: The final target speed of the motor
 - v. Acceleration Rate: Set the acceleration rate at which the motor reaches the target speed
 - vi. Stopping Speed: Can be used to set the stopping speed of the motor
 - vii. Number of Steps: Sets the number of steps to cover
 - viii. Steps to Stop: Sets the number of steps to stop
 - ix. Fault Clear: used to clear driver faults.
 - f. Adjust the settings as needed and select “Start Input Based STEP” to start spinning the motor and use the “Input-based Direction” to change motor direction.

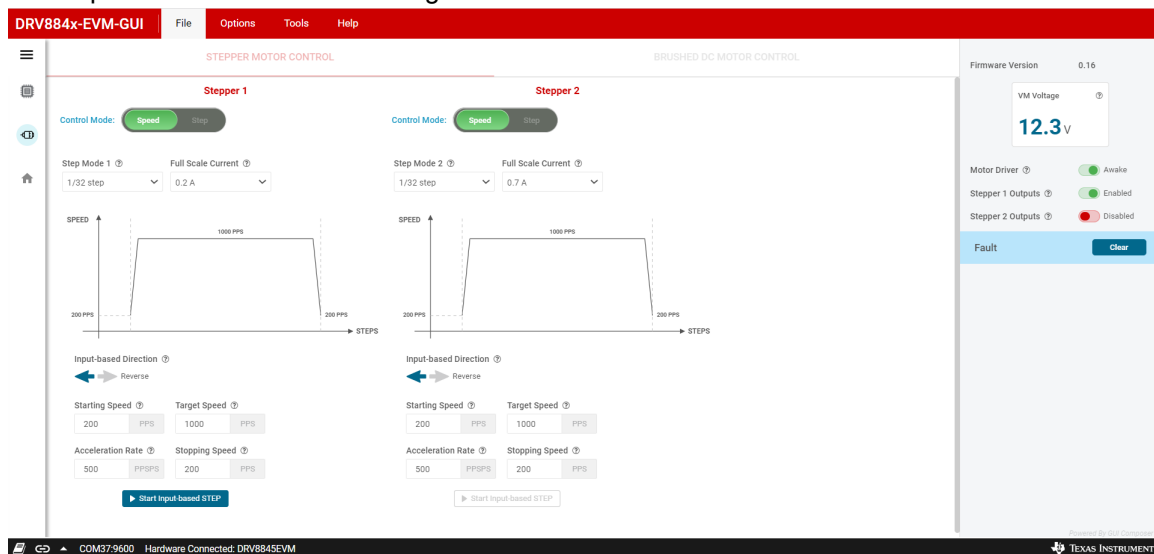


Figure 8-1. Stepper Control in DRV8845-EVM-GUI

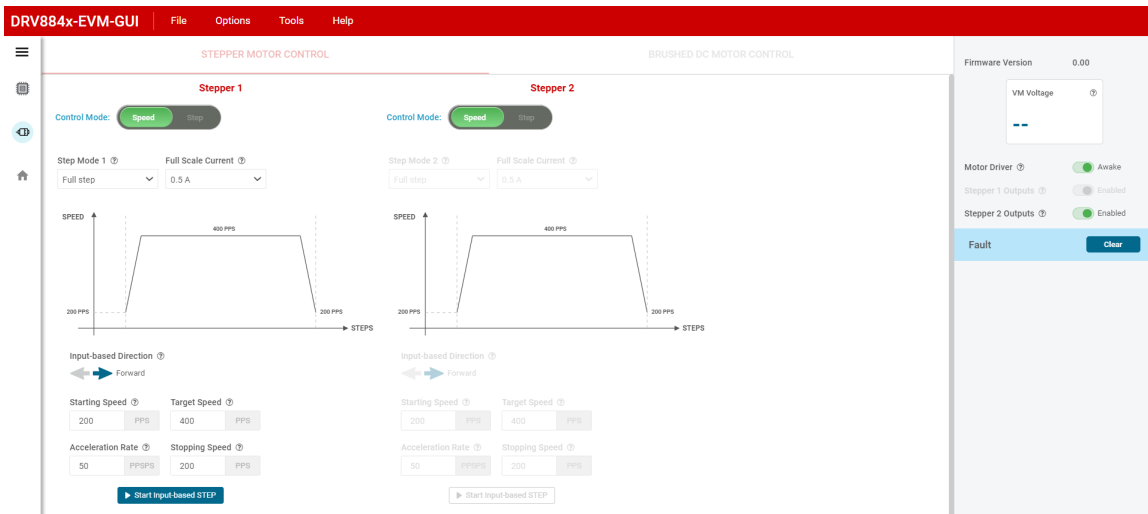


Figure 8-2. Dual Stepper Control in DRV8845-EVM-GUI

3. Brushed Motor Control

- a. To switch from “Stepper Motor Control” to “Brushed DC Motor Control”, first disable the stepper outputs and then put the motor driver to “Asleep” state.
- b. Set the “Motor Driver” to “Awake”
- c. Use the VREF1 & VREF3 and VREF3 & VREF4 widget inputs to enter a reference voltage less than or equal to 0.5625 V (0.5625 corresponds to 1.5 A based on the 330 milliohms current sense resistors used in the Rev A EVM hardware – see PWM Current Control section of the device data sheet).
- d. Use PWM Frequency drop down to select the desired PWM frequency.
- e. Select the desired number of Full bridges using the “Start Drive X” tab.
- f. Adjust the speed of the motor using the “Duty Cycle” slider.
- g. Adjust the direction of the motor spinning using the “Direction” tab
- h. The Phase x Ramp rate can be used to set the duty cycle ramp rate to the new set value.
- i. Parallel Mode:
 - i. To enter parallel mode:
 1. Put the device to sleep
 2. Turn off power supply (VM)
 3. Disconnect the USB from computer
 4. Remove jumper on PHASE4/STEP1
 5. Populate all jumpers on connector J13
 6. Reconnect USB
 7. Turn on power supply (VM)
 8. Go to Brushed Motor Control
 9. Turn on Motor Driver (awake state)
 10. Enable the Parallel Mode. H3 becomes H3 and H4. Whereas the earlier H4 will be greyed out.
 11. Then connect the BDC motor to Phase 3 (Connector J3)
 - ii. To exit parallel mode:
 1. Disable the Parallel Mode
 2. Put Motor Driver to asleep state
 3. Turn off power supply
 4. Disconnect USB
 5. Remove jumpers on J13
 6. Repopulate jumper on Phase4/STEP1
 7. Reconnect USB
 8. Turn on power supply
 9. Put the motor Driver to Awake state

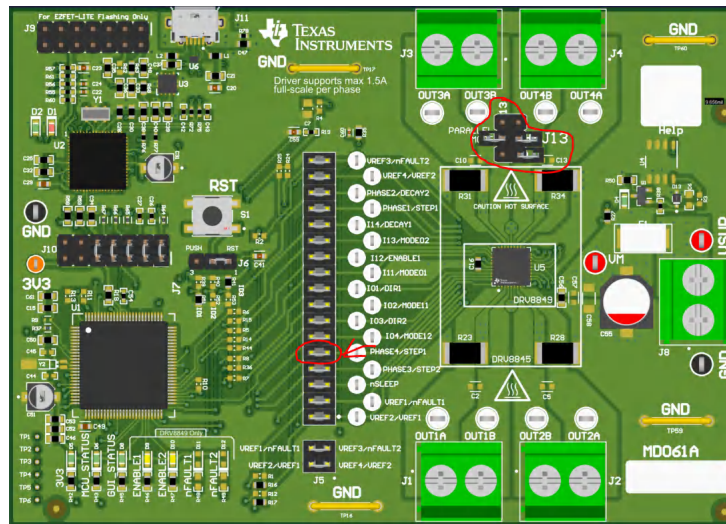


Figure 8-3. Parallel Mode Jumpers

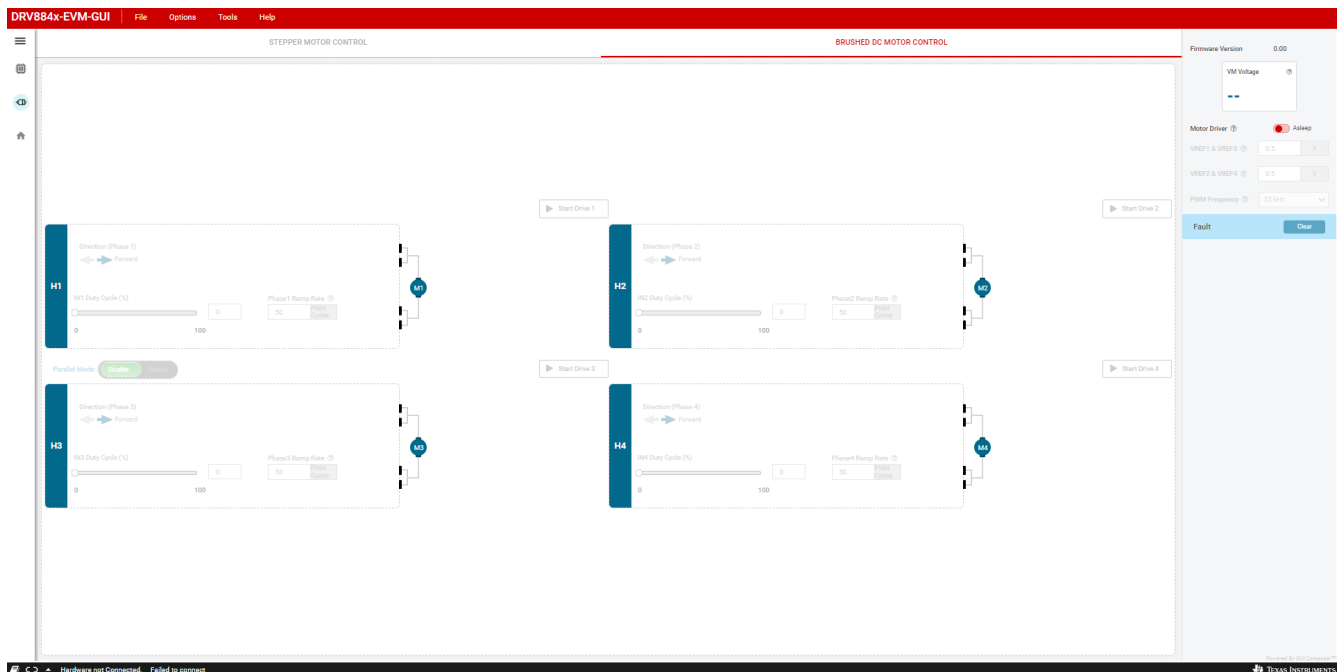


Figure 8-4. Brushed DC Motor Control in DRV8845-EVM-GUI

9 GUI Operations DRV8849

1. Go to the “Driver Control” tab.
2. Set the “Motor Driver” to “Awake” and the required stepper driver outputs to “Enabled”. (Enable either one output or both outputs at once to spin one or two motors respectively)
3. Select the desired “Control Mode” – This is a GUI app feature which allows selection between “Speed” mode and “Step” mode. In speed mode the motor can run at the set target speed using the defined acceleration and deceleration rate motion profile. In “Step” mode the motor can be stepped to the desired position by setting the required number of steps at the set target speed.
4. Features:
 - a. Step Mode: Can be used to set the microstepping mode
 - b. Full Scale Current: Can be used to set the full-scale current value
 - c. Starting Speed: The speed at which the motor starts spinning
 - d. Target Speed: The final target speed of the motor
 - e. Acceleration Rate: Set the acceleration rate at which the motor reaches the target speed
 - f. Stopping Speed: Can be used to set the stopping speed of the motor
 - g. Number of Steps: Sets the number of steps to cover
 - h. Steps to Stop: Sets the number of steps to stop
 - i. Reciprocate: Reciprocate the number of steps in opposite direction. Click 'Stop Steps' to stop the process
 - j. Fault Clear: used to clear driver faults.
 - k. Decay Mode: The Decay mode can be modified using the “Decay Mode” GUI push button in the STEPPER MOTOR CONTROL tab
5. Adjust the settings as needed and select “Start Input Based STEP” to start spinning the motor and use the “Input-based Direction” to change motor direction.

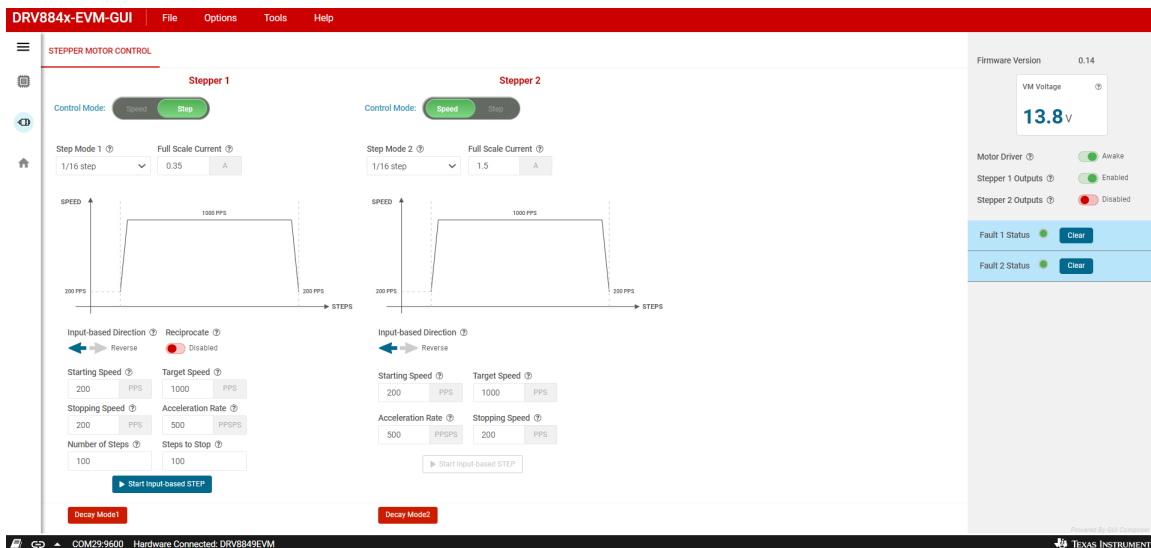


Figure 9-1. Stepper Control in DRV8849-EVM-GUI

Decay Mode

X

Decay Mode 1

Smart Tune Ripple C

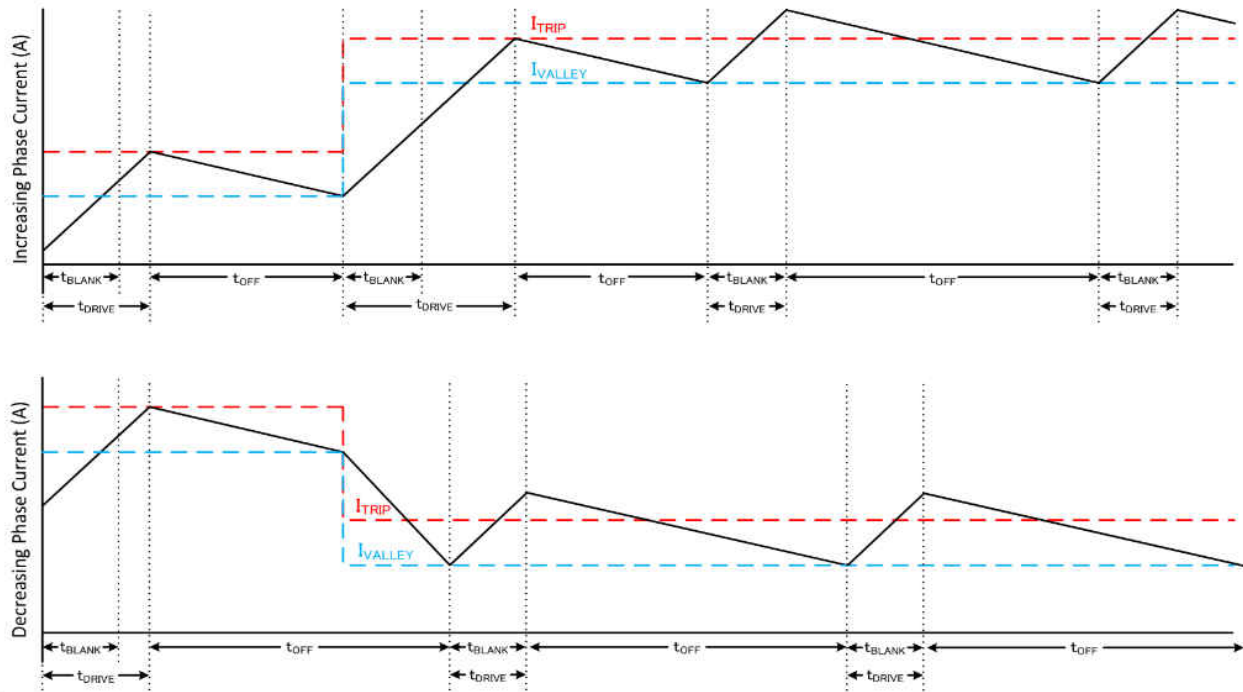


Figure 9-2. Decay Modes in DRV8849-EVM-GUI

10 Updating Firmware

Your EVM includes the ability to update the MCU firmware controlling the DRV884xEVM driver device without any additional hardware. There should be a pop-up every time the GUI Driver Control page is selected after an EVM connection is made and if a new update becomes available as can be seen in EVM Firmware Update Pop-Up.

EVM Firmware Update Available!

A new firmware update is available for the EVM hardware. Upgrade to the new version using the 'Program Device' function in the 'File' menu from the 'EVM Home' screen of the GUI.

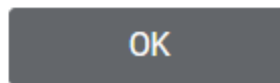


Figure 10-1. EVM Firmware Update Pop-up

The user can update the EVM to the latest firmware by simply going to File -> Program Device from either the EVM Home Page or the Driver Control page as shown in Figure 9-2. Successful firmware update will bring up a message window stating "Flash Successful!".

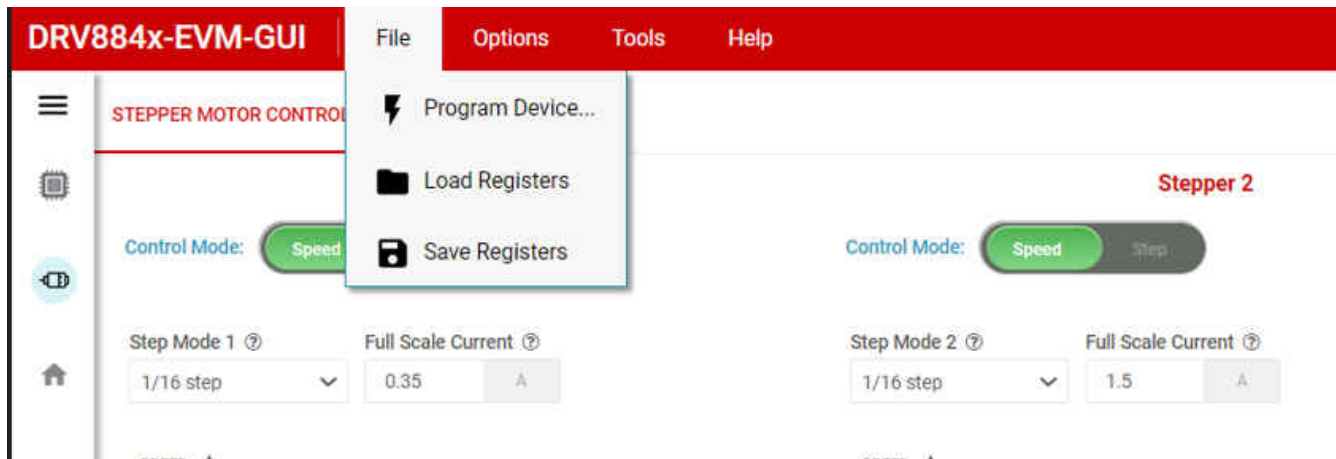


Figure 10-2. Update Firmware

11 Revision History

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

Table 11-1. Revision History

DATE	REVISION	NOTES
April 2023	*	Initial Release

STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an "EVM" or "EVMs") to the User ("User") in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.
 - 1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM ("Software") shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software
 - 1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.
2. *Limited Warranty and Related Remedies/Disclaimers:*
 - 2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.
 - 2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.
 - 2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

WARNING

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

User shall operate the Evaluation Kit within TI's recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI's recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI's instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGRADATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 Regulatory Notices:

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:

FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

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

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 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.

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.

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.

3.3 Japan

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。

<https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html>

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

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.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。技術適合証明を受けていないものご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。日本テキサス・イ

ンスツルメンツ株式会社

東京都新宿区西新宿 6 丁目 2 4 番 1 号

西新宿三井ビル

3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_02.page

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。 <https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html>

3.4 European Union

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. *EVM Use Restrictions and Warnings:*
 - 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.
 - 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.
 - 4.3 *Safety-Related Warnings and Restrictions:*
 - 4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.
 - 4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.
 - 4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.
 5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.
 6. *Disclaimers:*
 - 6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.
 - 6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.
 7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

8.1 *General Limitations.* IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS , REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMNITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

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