DRV8350x-EVM GUI User's Guide

This document is provided with the DRV8350x-EVM customer evaluation module (EVM) as a supplement to the DRV835x data sheet (*DRV835x 100-V Three-Phase Smart Gate Driver*). This user's guide details the hardware implementation of the EVM and how to use DRV8350x-EVM GUI Application.

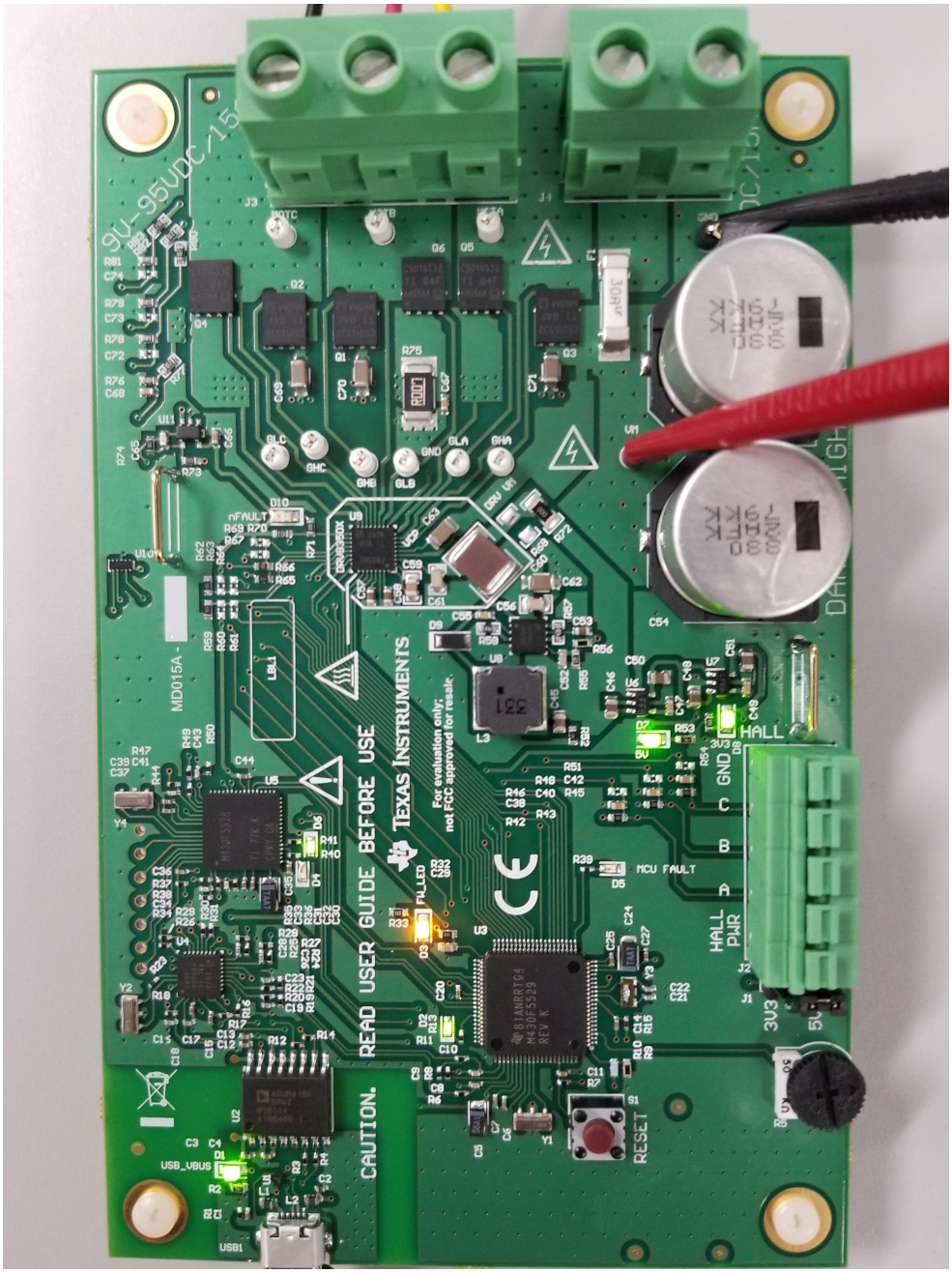

Figure 1. DRV8350x-EVM

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Contents

1 Hardware and Software Setup 3
2 GUI Application 3
2.1 Installation 3
2.2 DRV8350x-EVM GUI 4

List of Figures

1 DRV8350x-EVM 1
2 DRV8350x-EVM GUI (Device Launch Page) 3
3 Windows Security Pop-Up Window 4
4 DRV8350H-EVM Device Page 5
5 Device Connection (Status Bar) 5
6 COM Port (FriendlyName) 6
7 Register Page 7
8 Motor Control - Sensored 7
9 Motor Control - Sensorless 8
10 Choose New Device 9
11 Toolbar—File 10
12 Toolbar—Tools 10
13 Toolbar—Help 11

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1 Hardware and Software Setup

The hardware (HW) and software (SW) tools that follow are required for the evaluation of DRV835xx devices:

- MSP430F5529 microcontroller
- DRV8350x-EVM
- Three-phase BLDC motor
- Voltage supply 12 to 95 V, and up to 20 A for direct-current (DC) bus
- Jumper wires (for connections).
- DRV8350X + MSP430F5529 trapezoidal BLDC motor control firmware
- DRV8350x-EVM GUI for modifying BLDC motor control parameters
- Code Composer Studio™ software V.5.4 and above

For additional details on hardware connections refer to the *DRV8350x-EVM User's Guide*.

NOTE: Operate this EVM only at the default IDRIVE setting 150 mA / 300 mA sink/source current.

2 GUI Application

The image below shows the launch page for the DRV8350x-EVM GUI.

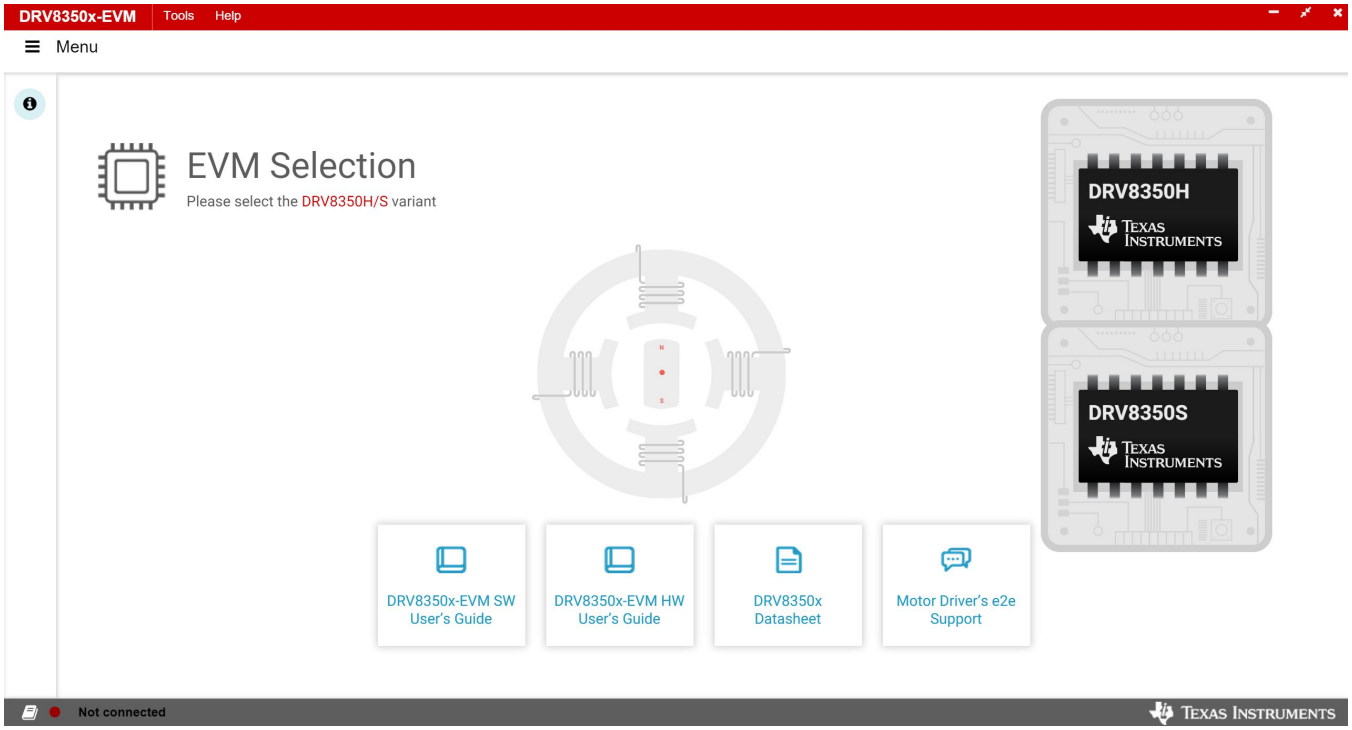

Figure 2. DRV8350x-EVM GUI (Device Launch Page)

2.1 Installation

Follow these steps to install the DRV8350x-EVM application:

Step 1. Install the GUI.

Download and run the *installer Setup_DRV835x-1.0.0_EVM.exe* file to install the GUI application.

Step 2. Install the COM port driver for *TI MSP430 USB* which is the firmware on the MSP430F5529 MCU.

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This driver will get installed automatically during the GUI installation process. Select *Install* option when the pop-up shown below appears during the GUI installation. If this pop-up does not appear, the drivers are already installed.

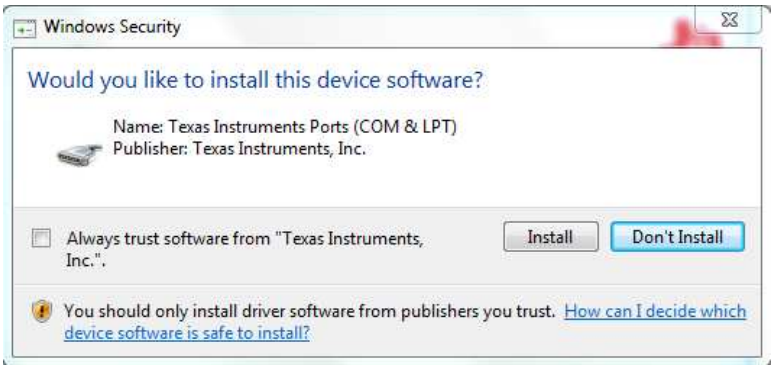

Figure 3. Windows Security Pop-Up Window

If the automatic driver installation fails for some reason or the *Don't Install* option was selected from the pop-up shown above, the drivers must be installed manually using the steps that follow:

Step 1. Locate the driver INF file (msp430_ti_signed.inf) in the following folder path: C:\Program Files (x86)\Texas Instruments\DRV8350x-EVM\TI MSP430 USB Driver.

Step 2. Right click on the INF file and select the *Install* option.

Step 3. Follow the installation instructions to successfully install the driver.

If any issues still occur during the driver installation steps or to learn more about the process, download and extract the *MSP430 USB Developers Package* file from http://www.ti.com/tool/msp430usbdevpack and refer to sections 2.5.2 (Windows 7) and 2.5.3 (Windows 8) in the *Examples_Guide_MSP430_USB.pdf* document. This document can be found under *MSP430USBDevelopersPackage_5_10_00_17\MSP430_USB_Software\Documentation* directory of the extracted *MSP430 USB Developers Package* file.

2.2 DRV8350x-EVM GUI

The DRV8350x-EVM GUI along with DRV8350x-EVM facilitates control of brushless DC motors using various control widgets. It provides functionality for adjusting the speed and direction of the motor, setting various fault parameters such as voltage and current protection limits, observing the motor drive speed, and monitoring the device fault status. The user can also tune the motor for best performance using various parameters available in the motor-control parameter page. Use the steps that follow to get started with the GUI:

Step 1. Connect the BLDC motor to the EVM.

Step 2. Plug in the micro-USB cable to the EVM and to the PC.

Step 3. Enable the DC power supply.

Step 4. Click on the DRV8350x-EVM shortcut either on the desktop or from the start menu to run the GUI application.

The *Device Launch* page appears to launch one of the two device variants: DRV8350S, and DRV8350H.

Step 5. Make sure to launch the correct device that matches the target device.

Step 6. Click on one of the device variant clickable boxes on the Device Launch Page.

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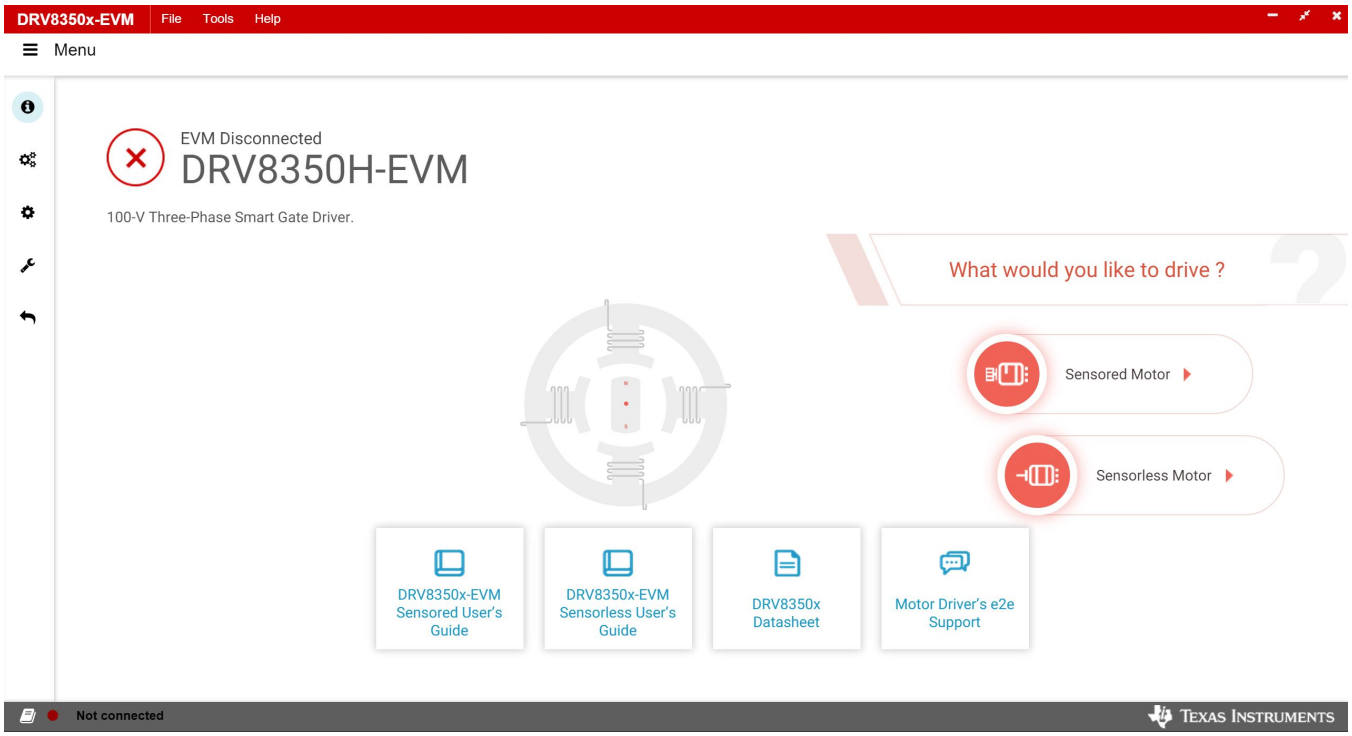

Figure 4. DRV8350H-EVM Device Page

Step 7. The GUI attempts to establish the connection with the launched device automatically if the device is already connected to the PC. On these Device Pages you can see links to the DRV835x Sensored Software User's Guide and DRV835x Sensorless Software User's Guide. The COM port and the target device name will be updated in the status bar as shown below.



Figure 5. Device Connection (Status Bar)

If the EVM is not connected to the USB port, the status bar displays *Not connected*.

Step 8. Click on *OK* to go back to the device launch page to launch the correct device.

Step 9. If the MSP430F5529 is not connected to the PC or a correct firmware is not loaded, go to the *Serial Port* page to manually select an available COM port.

The *Serial Port* page displays the list of COM ports available for opening the connection as shown below. If nothing is physically connected to the PC, the COM list in the drop-down menu displays *-- No Ports --*.

The GUI connects to the relevant COM port and identifies the target automatically. This COM port will have the *FriendlyName* property of *TI MSP430 USB* under the *COM Details* table. However, if this COM port is closed manually by clicking the *Close* button, select and open the relevant COM port.

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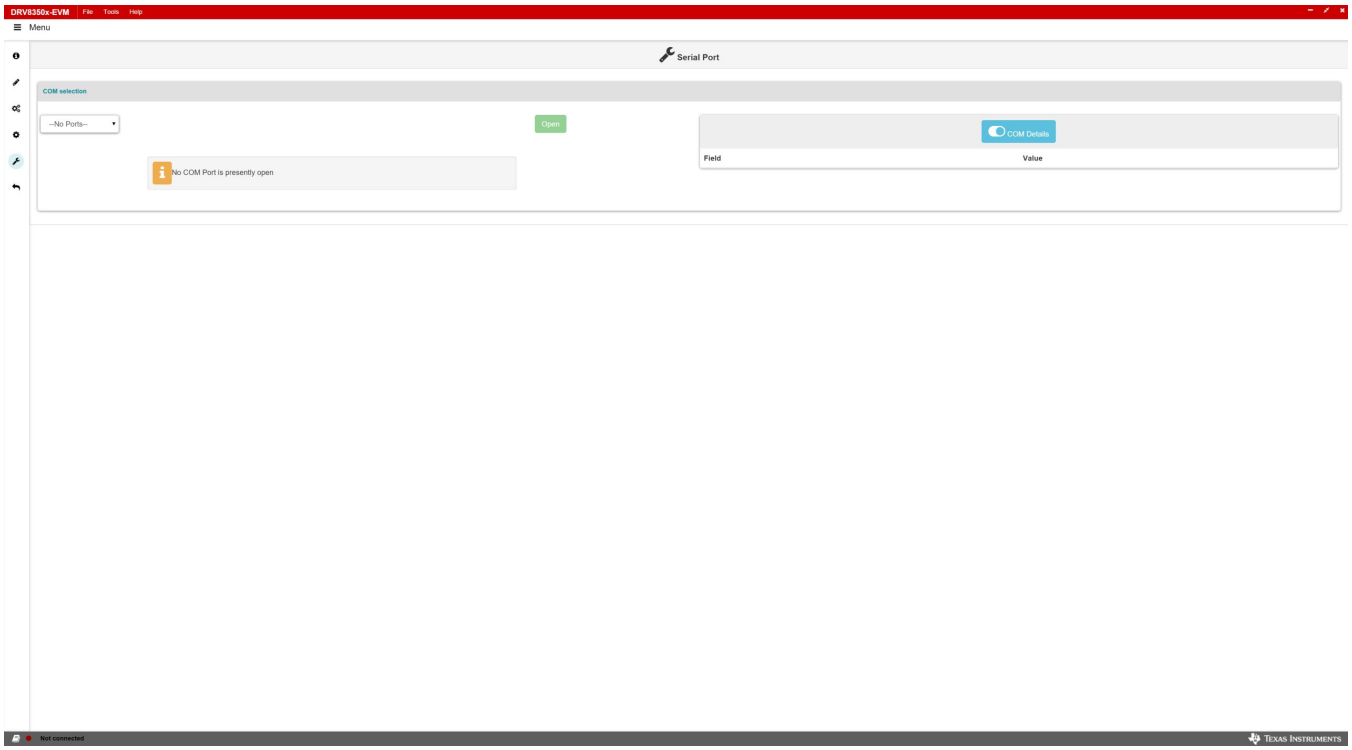

Figure 6. COM Port (FriendlyName)

Step 10. Select the relevant COM port from the drop-down menu and click the *Open* button. To see details on each available COM port click on the *COM Details* checkbox. In the *COM Details* table, look for the *FriendlyName* property to decide which port to connect because the COM port changes dynamically and is OS dependent.

After the GUI connects, the connection status appears in the status bar. If a COM port is connected and the firmware on it fails to identify the device, the status displays *Device: NONE*. Therefore TI recommends always connecting the COM port with the *FriendlyName TI MSP430 USB* either automatically or manually.

Step 11. Click on the *Menu* on the top-left corner of the GUI to open a side-bar menu.

Step 12. Use the side-bar menu to navigate to the following pages or sub-pages at any point in time. The pages that follow are in context to the launched device:

- Registers
- Motor Control - Sensored
- Motor Control - Sensorless
- Serial Port
- Choose new device

Step 13. Registers page

This page shows all the registers and their fields present on the device. The page allows reading and writing any register, field, or bit. Click on the question mark icon on any register or field to get in-place data sheet help.

NOTE: The *H* device variants do not have the Register Page

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Figure 7. Register Page

Step 14. Motor Control - Sensored Page

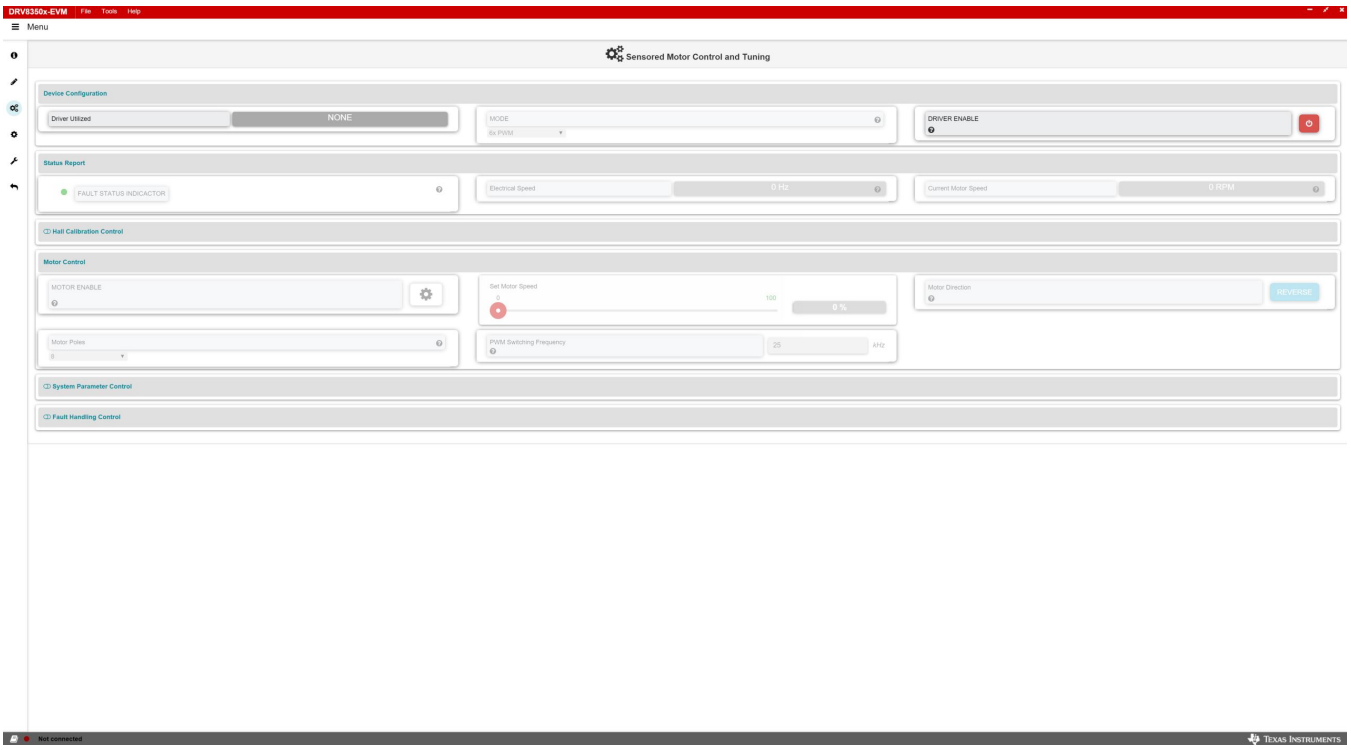

Figure 8. Motor Control - Sensored

This page has different widget controls to control the motor and tune the parameters using the *Sensored* algorithm as shown in the image above.

- The *DRV835x Sensored Software User's Guide* document gives an understanding of *Sensored* operation and details each of the parameters on this page.

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- Click on the question mark icon available on each of the controls to understand operation of that particular widget.

Follow these steps to run the motor:

1. Enable the driver
   1. Click on the *DRIVER ENABLE* button to turn it green.
   2. If necessary, write appropriate values to the registers from the *Register Page*.

NOTE: When the driver is disabled, the register read-write (R/W) operations are not allowed.

2. Set the appropriate motor speed

   Change the percentage of duty cycle value using the *Set Motor Speed* slider. Make sure the set value is greater than the *Minimum Duty Cycle* value.
3. Start the motor.

   Click on the *MOTOR ENABLE* button to turn it green.
4. Monitor the *Status Report Panel* (FAULT STATUS INDICATOR, Electrical Speed, Current Motor Speed)
   - If any fault is present, the motor stops spinning and the corresponding fault is reported under *FAULT STATUS INDICATOR*.
   - Perform necessary actions to come out of the fault. For example, change the motor parameter values related to the fault.

Step 1. Motor Control - Sensorless Page

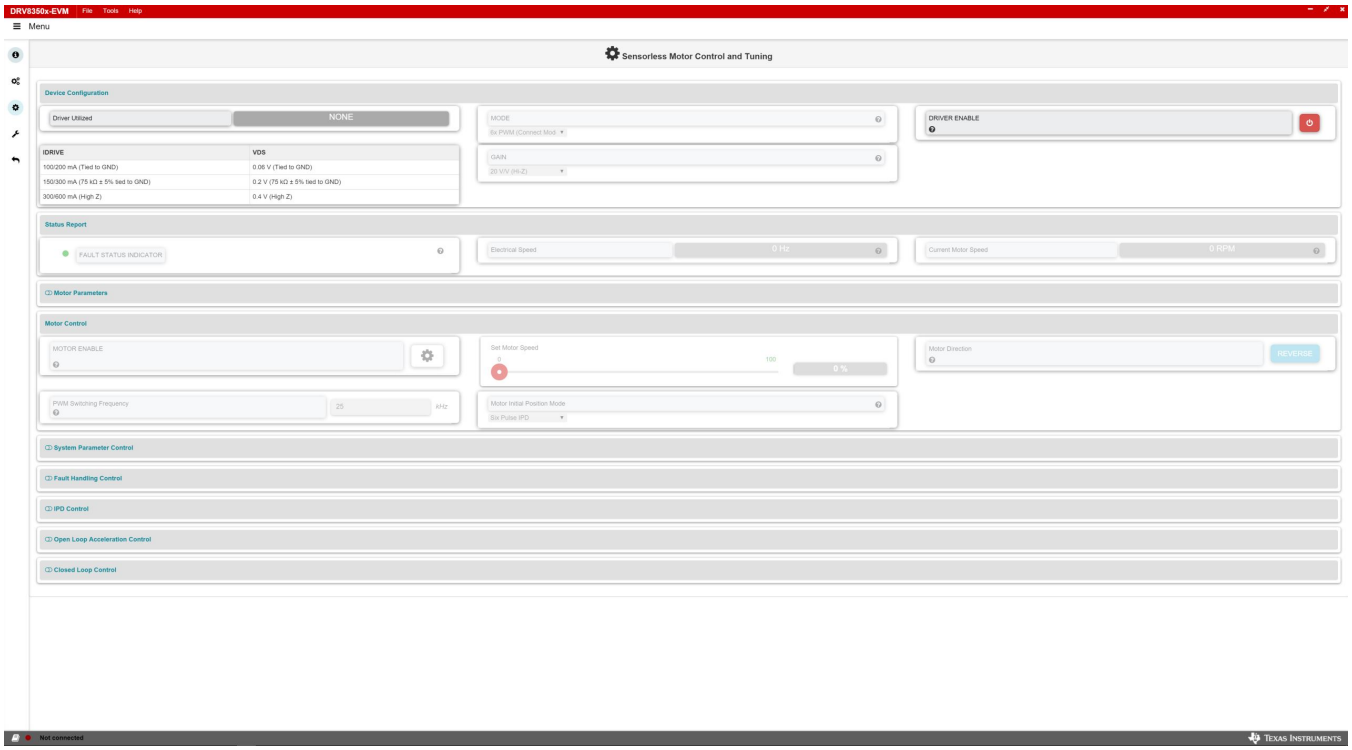

Figure 9. Motor Control - Sensorless

This page has different widget controls to control the motor and tune the parameters using the *Sensorless* algorithm as shown above.

- The *DRV835x Sensorless Software User's Guide* document gives anunderstanding of *Sensorless* operation and details each of the parameters on this page.
- Click on the question mark icon available on each of the controls to understand operation of that particular widget.

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Follow these steps to run the motor:

1. Enable the driver
    1. Click on the *DRIVER ENABLE* button to turn it green.
    2. If necessary, write appropriate values to the registers from the *Register Page*.

NOTE: When the driver is disabled, the register read-write (R/W) operations are not allowed.

2. Set appropriate motor speed

    Change the percentage of duty cycle value using the *Set Motor Speed* slider. Make sure the set value is greater than the *Minimum Duty Cycle* value.

3. Start the Motor

    Click on the *MOTOR ENABLE* button to turn it green.

4. Monitor the *Status Report Panel* (FAULT STATUS INDICATOR, Electrical Speed, Current Motor Speed)
    - If any fault is present, the motor stops spinning and the corresponding fault is reported under *FAULT STATUS INDICATOR*.
    - Perform necessary actions to come out of the fault. For example, change the motor parameter values related to the fault.

Step 2. Choose new device

This option is available on the sidebar menu to go back to the *Device Launch* page to launch a new device.

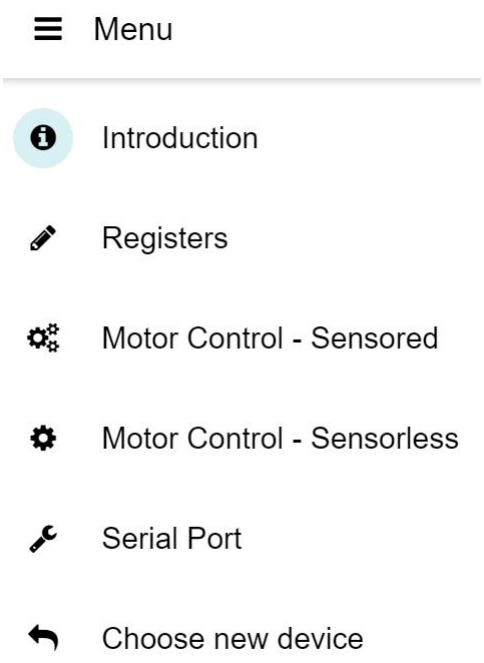

Figure 10. Choose New Device

Step 3. Toolbar options

The following Toolbar options are available on the top of the GUI.

- File—Different options in this menu are available to load and save from and to a JSON file respectively: the register values on the register page, sensored motor control settings, and sensorless motor control settings

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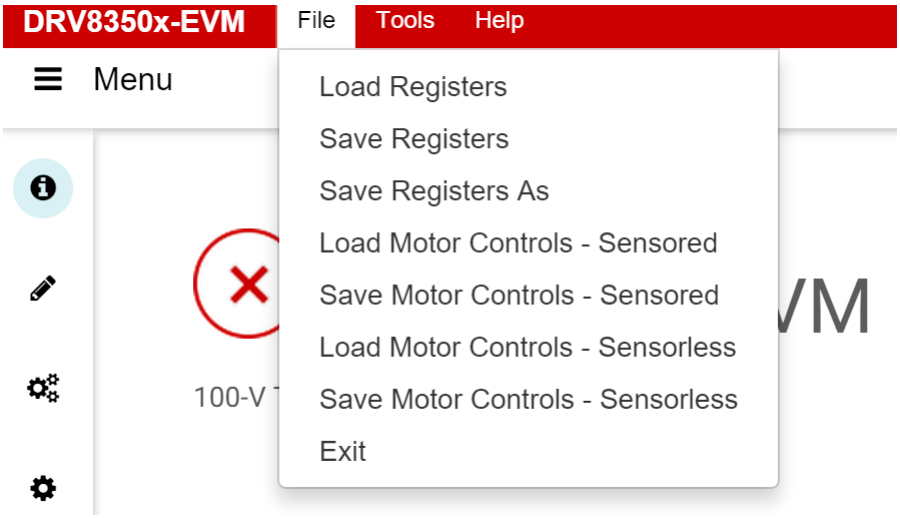

Figure 11. Toolbar—File

- View—The options under this menu are the same as the sidebar menu options to navigate to any page or sub-page in the GUI.
- Tools—The only available option in this menu is to open a log page at the bottom of the GUI which shows different logs: information, warning, error, debug.

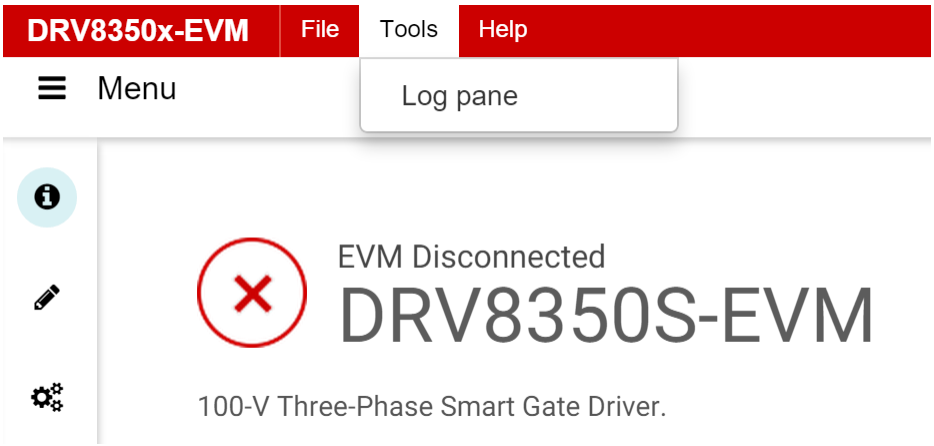

Figure 12. Toolbar—Tools

- Help—This menu includes an About option to see GUI information.

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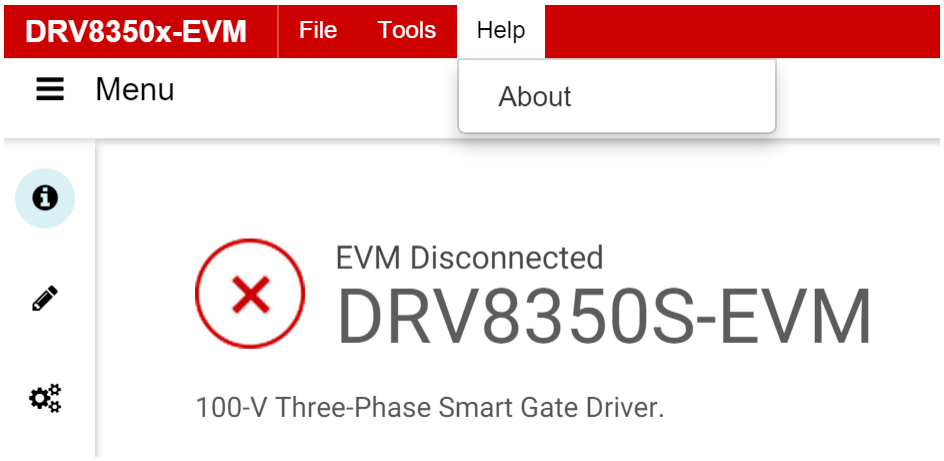

Figure 13. Toolbar—Help

The DRV8350x-EVM can be controlled by following these steps in the GUI application.

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