User's Guide
SLVUB14–February 2017

BOOSTXL-DRV832X EVM GUI User's Guide

This document is provided with the BOOSTXL-DRV832X customer evaluation module (EVM) as a supplement to the DRV832x data sheet (*DRV832x 6 to 60-V Three-Phase Smart Gate Driver*). This user's guide details the hardware implementation of the EVM and how to use BOOSTXL-DRV832X EVM GUI Application.

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1 Hardware and Software Setup

The hardware (HW) and software (SW) tools that follow are required for the evaluation of DRV832xx devices:

- MSP430F5529 XL LaunchPad™ development kit
- BOOSTXL-DRV832X EVM
- Three-phase BLDC motor
- Voltage supply 6 to 54 V, and up to 10 A for direct-current (DC) bus
- Jumper wires (for connections).
- DRV832XX + MSP430F5529 trapezoidal BLDC motor control firmware
- BOOSTXL-DRV832X 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 *BOOSTXL-DRV8320x EVM User Guide* or *BOOSTXL-DRV8323Rx EVM User Guide*.

2 GUI Application

Figure 1 shows the launch page for the BOOSTXL-DRV832X EVM GUI.

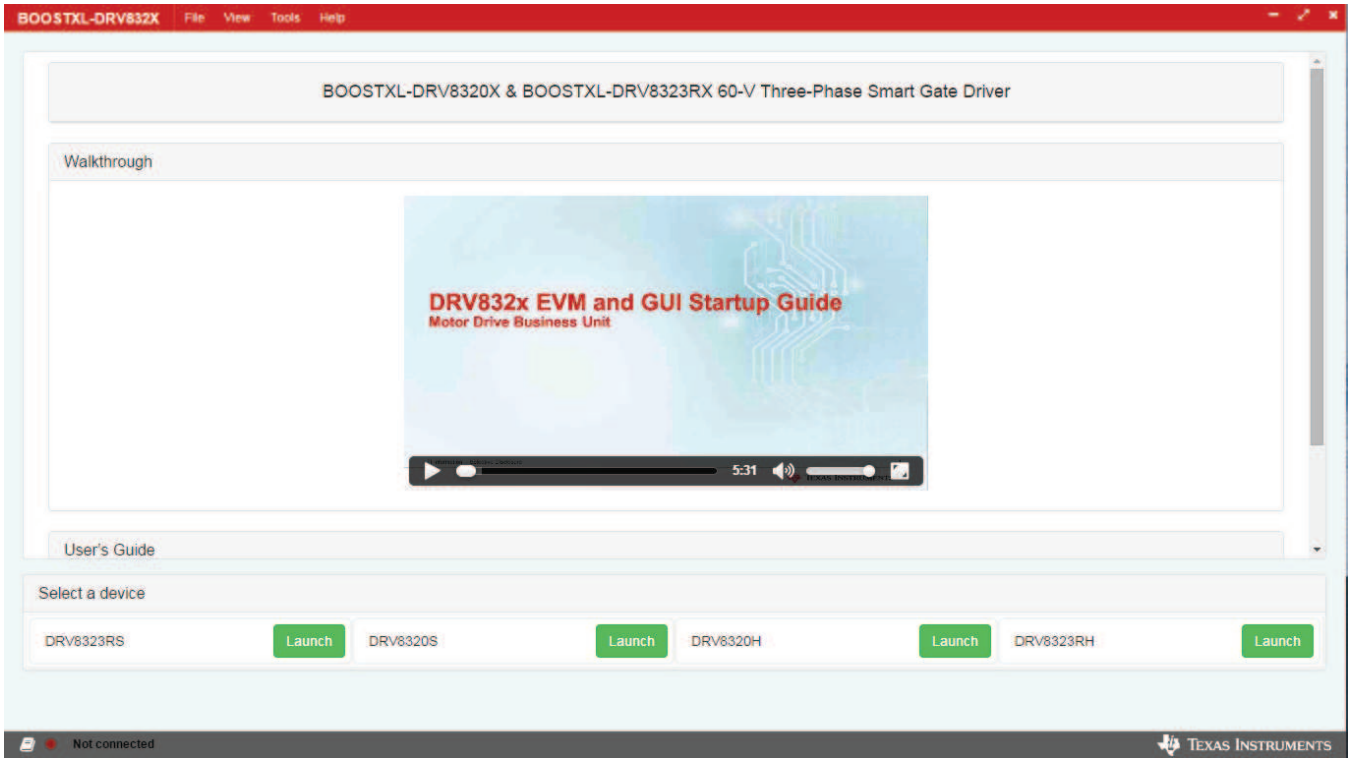

Figure 1. BOOSTXL-DRV832X EVM GUI (Device Launch Page)

2.1 Installation

Follow these steps to install the BOOSTXL-DRV832X application:

Step 1. Install the GUI.

Download and run the *installer Setup_boostxldrv832x-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 LaunchPad development kit.

This driver will get installed automatically during the GUI installation process. Select *Install* option when

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the pop-up shown in Figure 2 appears during the GUI installation. If this pop-up does does not appear, the drivers are already installed.

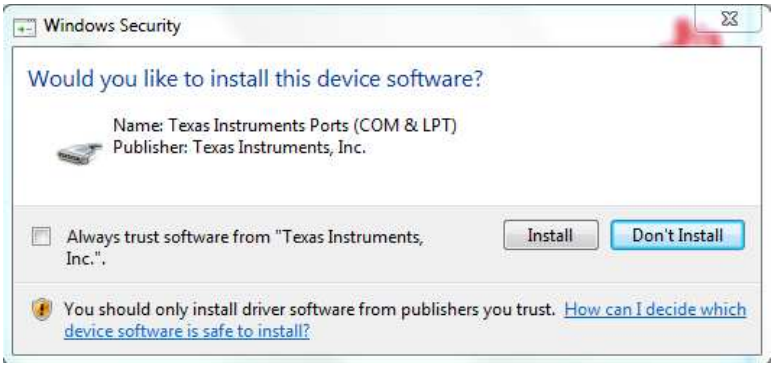

Figure 2. Windows Security Pop-Up Window

If the automatic driver installation fails for some reason or the *Don't Install* option was selected from the pop-up in Figure 2, 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\BOOSTXL-DRV832X\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 BOOSTXL-DRV832X EVM GUI

The BOOSTXL-DRV832X EVM GUI along with BOOSTXL-DRV832X 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 BoosterPack™ plug-in module.

Step 2. Plug in the micro-USB of the MSP430F5529 LaunchPad cable to the PC.

Step 3. Enable the DC power supply (see Section 1).

Step 4. Click on the BOOSTXL-DRV832X 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 four device variants: DRV8323RS, DRV8320S, DRV8323RH, and DRV8320H.

Step 5. Click on one of the *Launch* buttons to launch one of the mentioned device variants.

Step 6. Make sure to launch the correct device that matches the target device.

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Figure 3. Device Launch Page

Step 7. The GUI attempts to establish the connection with the launched device automatically if the device is already connected to the PC. The COM port and the target device name will be updated in the status bar as shown in Figure 4.

Figure 4. Launched Correct Device

If the LaunchPad development kit is not connected to the USB port, the status bar displays *Not connected*.

If the launched device does not match the target device on the LaunchPad development kit, the status bar displays the connection status with an error as shown in Figure 5.

Figure 5. Launched Wrong Device (Device Mismatch Error)

Step 8. Click on the error icon to open the dialog box shown in Figure 6 to resolve the device mismatch error.

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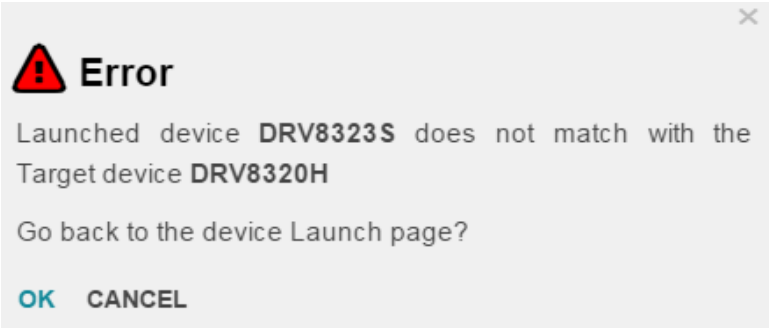

Figure 6. Device Mismatch Error

Step 9. Click on *OK* to go back to the device launch page to launch the correct device.

Step 10. If the MSP430F5529 LaunchPad development kit 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 in Figure 7. 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 as shown with the red arrow in Figure 7. However, if this COM port is closed manually by clicking the *Close* button, select and open the relevant COM port according to Step 11.

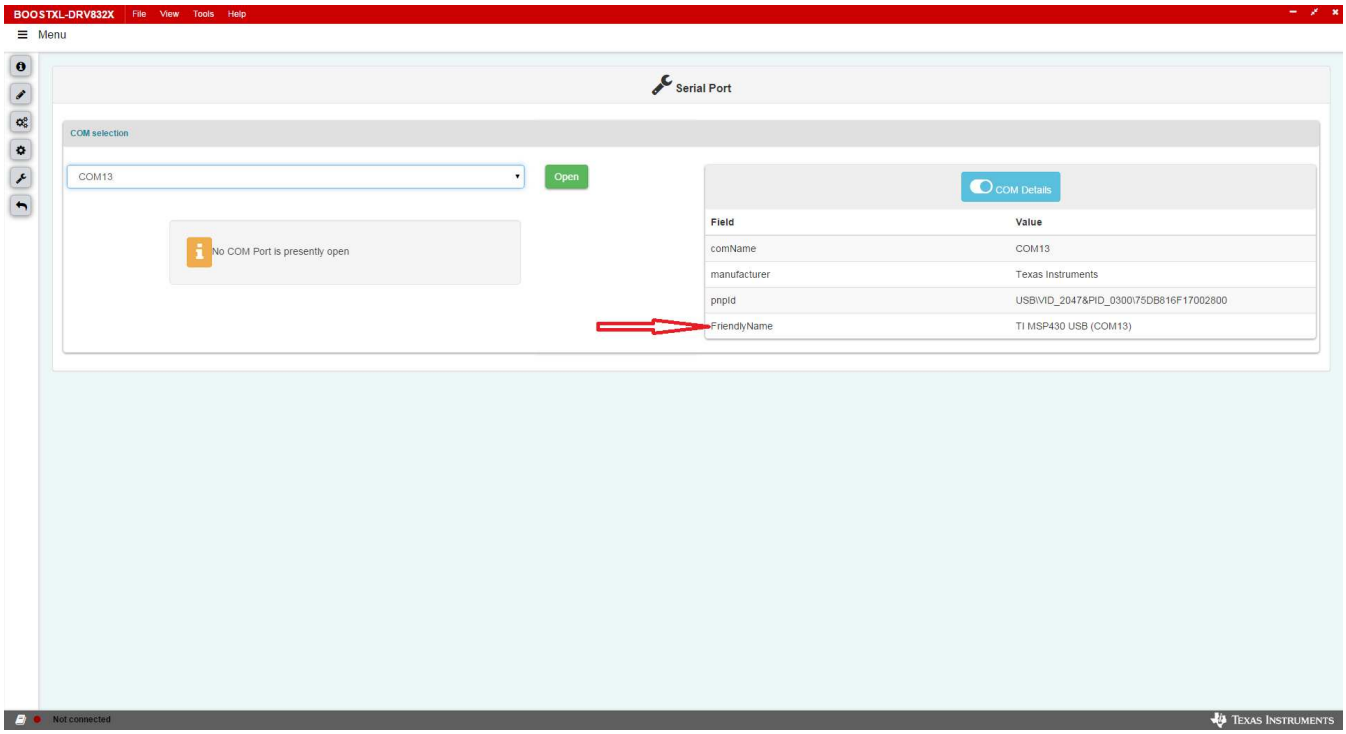

Figure 7. COM Port (FriendlyName)

Step 11. 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* (as shown in Figure 7) 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* as shown in

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Figure 8. Therefore TI recommends always connecting the COM port with the *FriendlyName TI MSP430 USB* either automatically or manually.

Figure 8. Device Not Found on Opened COM

Step 12. Click on the *Menu* on the top-left corner of the GUI to open a side-bar menu.

Step 13. 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:

- Introduction
  - Device
  - EVM
- Registers
- Motor Control - Sensored
- Motor Control - Sensorless
- Serial Port
- Choose new device

Step 14. Introduction page

The Introduction page has the general information about the launched device. The sub-pages *Device* and *EVM* under the *Introduction* page have the detailed description about the device and corresponding BoosterPack, respectively.

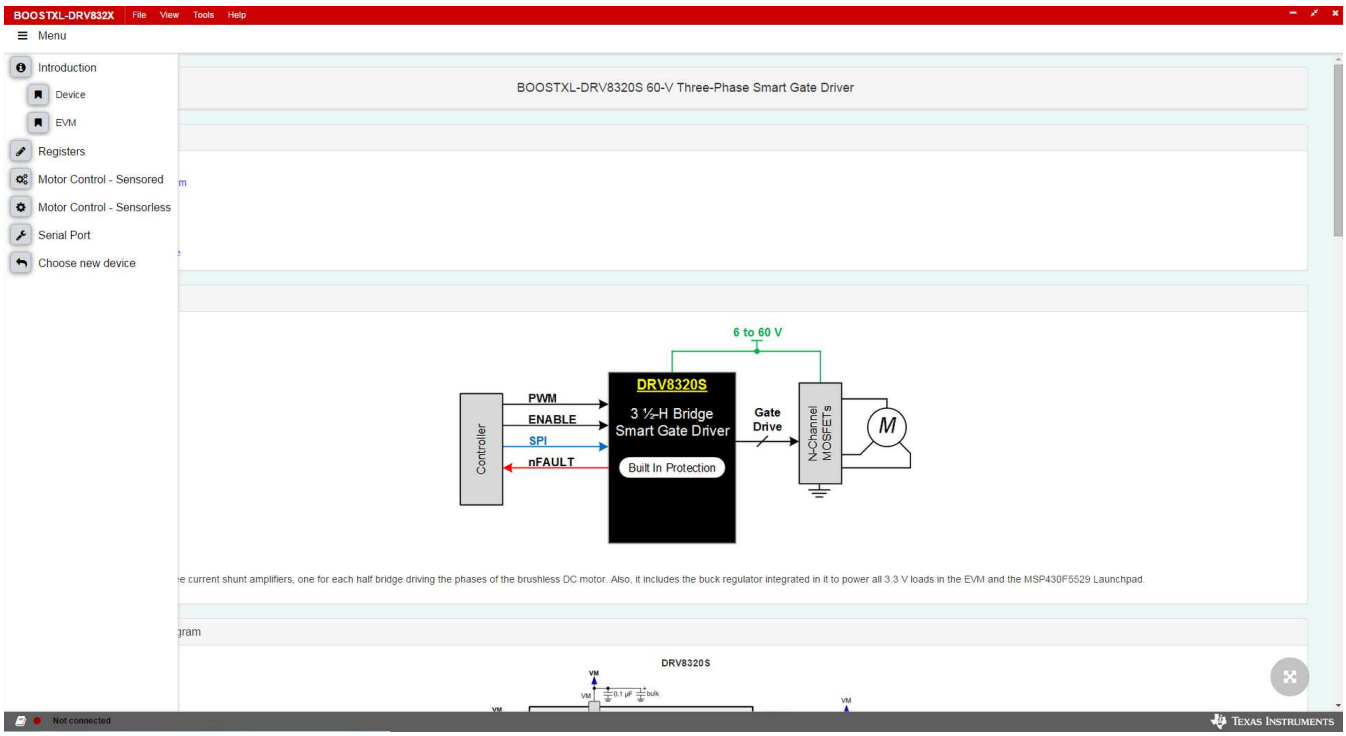

Figure 9. Introduction Pages

Step 15. 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

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data sheet help.

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

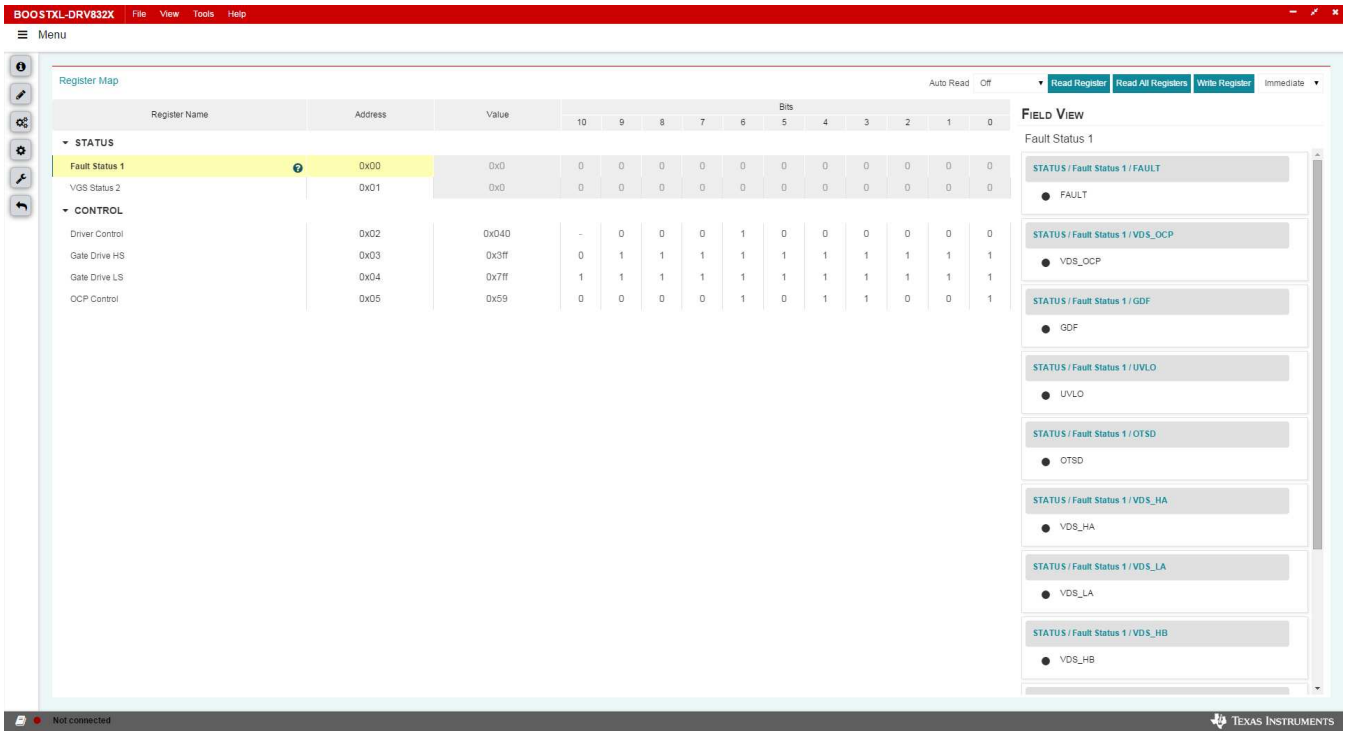

Figure 10. Register Page

Step 16. Motor Control - Sensored Page

This page has different widget controls to control the motor and tune the parameters using the *Sensored* algorithm as shown in Figure 11.

- Click on the *DRV832x Sensored Software User's Guide* document link on the top of this page to understand *Sensored* operation and get details on 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.

Follow these steps to run the motor:

(a) Enable the driver

(i) Click on the *DRIVER ENABLE* button to turn it green.

(ii) 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.

(b) 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.

(c) Start the motor.

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

(d) 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*.

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- Perform necessary actions to come out of the fault. For example, change the motor parameter values related to the fault.

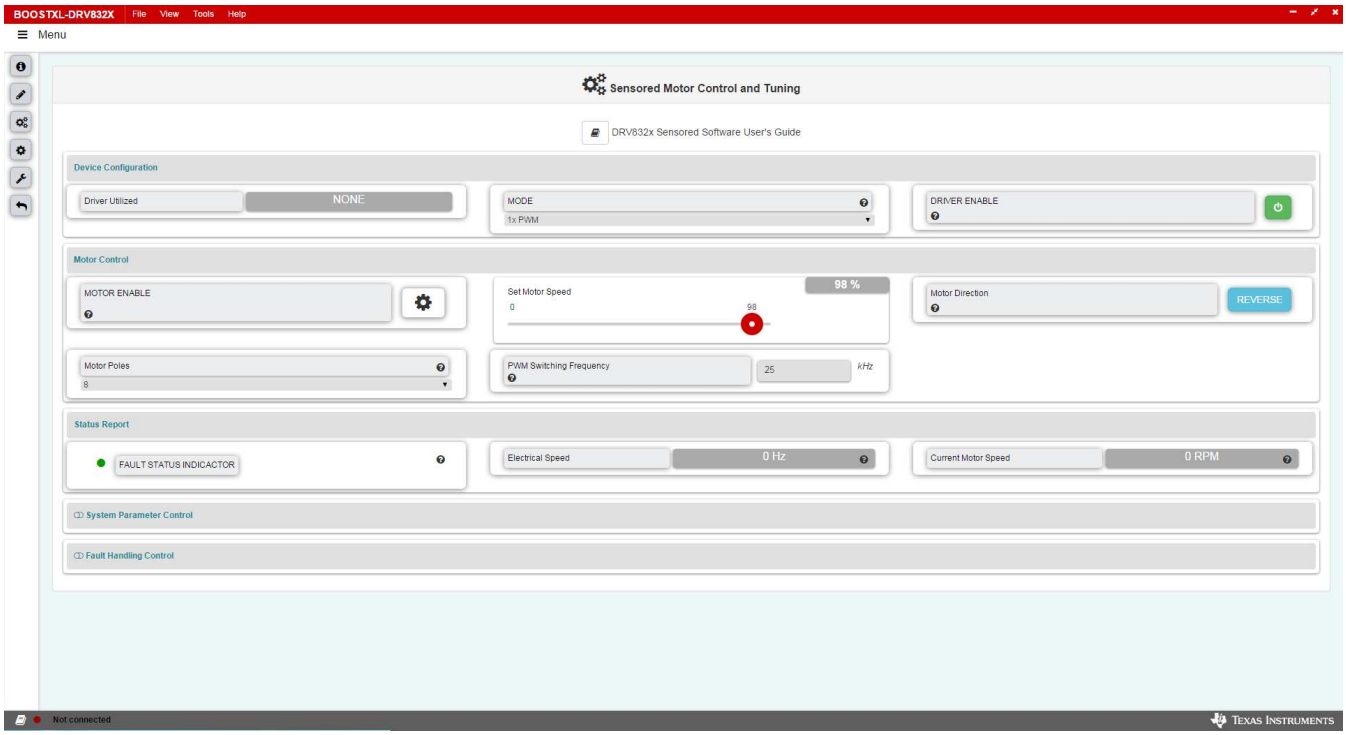

Figure 11. Motor Control - Sensored

Step 17. Motor Control - Sensorless Page

This page has different widget controls to control the motor and tune the parameters using the *Sensorless* algorithm as shown in Figure 12.

- Click on the *DRV832x Sensorless Software User's Guide* document link on the top of this page to understand *Sensorless* operation and get details on 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.

Follow these steps to run the motor:

(a) Enable the driver

(i) Click on the *DRIVER ENABLE* button to turn it green.

(ii) 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.

(b) 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.

(c) Start the Motor

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

(d) 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.

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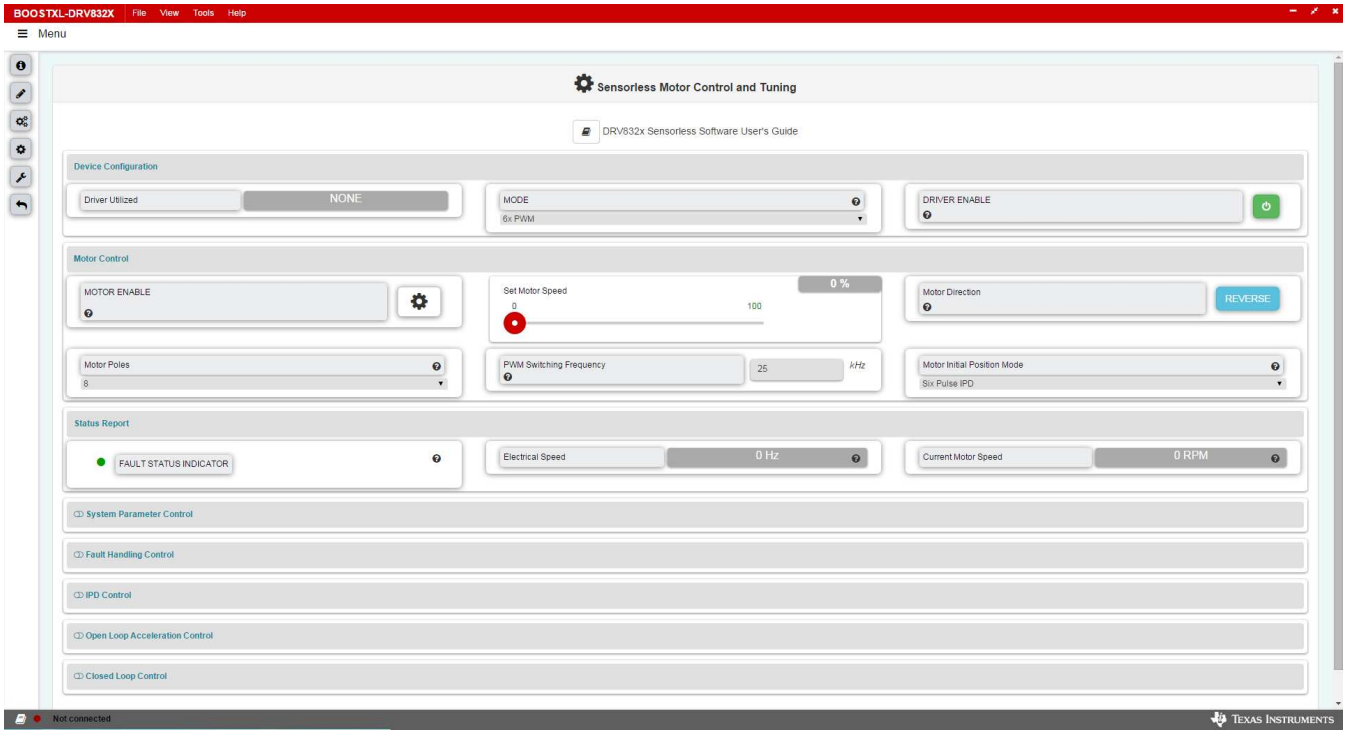

Figure 12. Motor Control - Sensorless

Step 18. Choose new device

This option is available on the sidebar menu to go back to the *Device Launch* page to launch a new device. The option is marked with a red arrow in Figure 13.

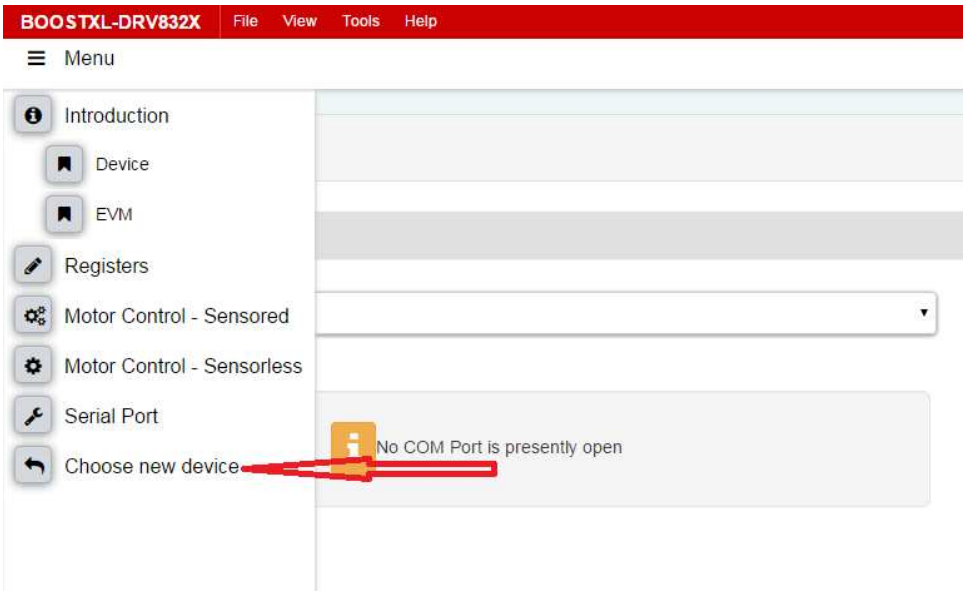

Figure 13. Choose New Device

Step 19. 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

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sensorless motor control settings

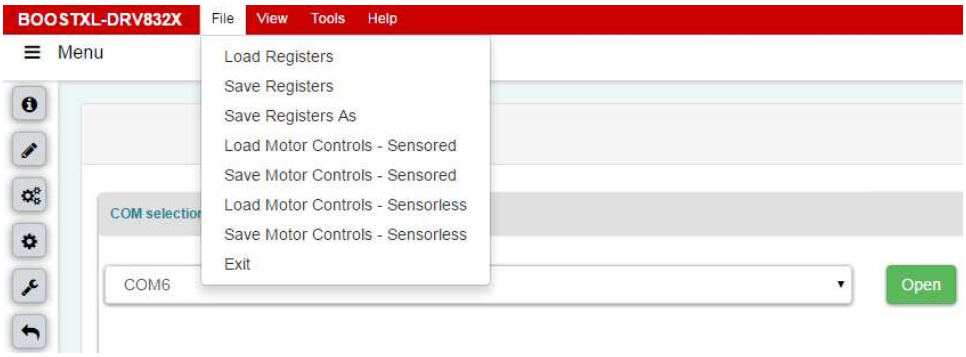

Figure 14. Toolbar—File

- 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.

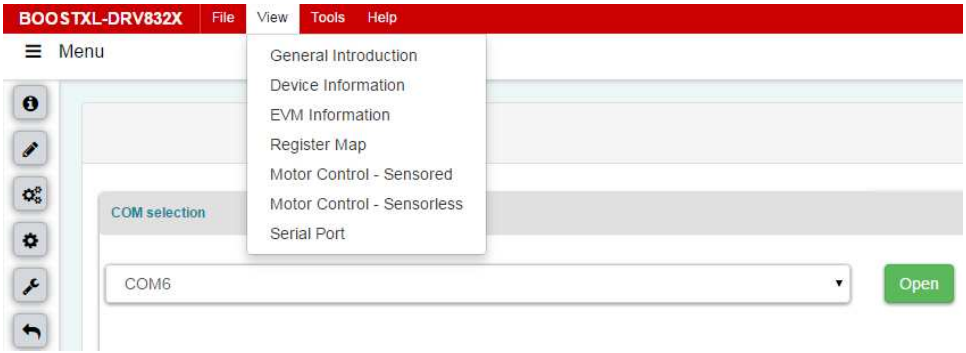

Figure 15. Toolbar—View

- 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.

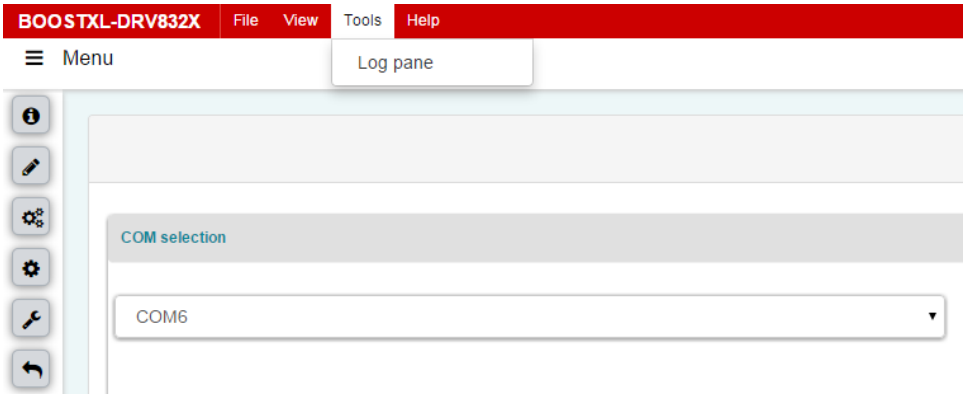

Figure 16. Toolbar—Tools

- Help—This menu includes links to different available documents and forums. This menu also shows the information on this GUI application under the *About* option.

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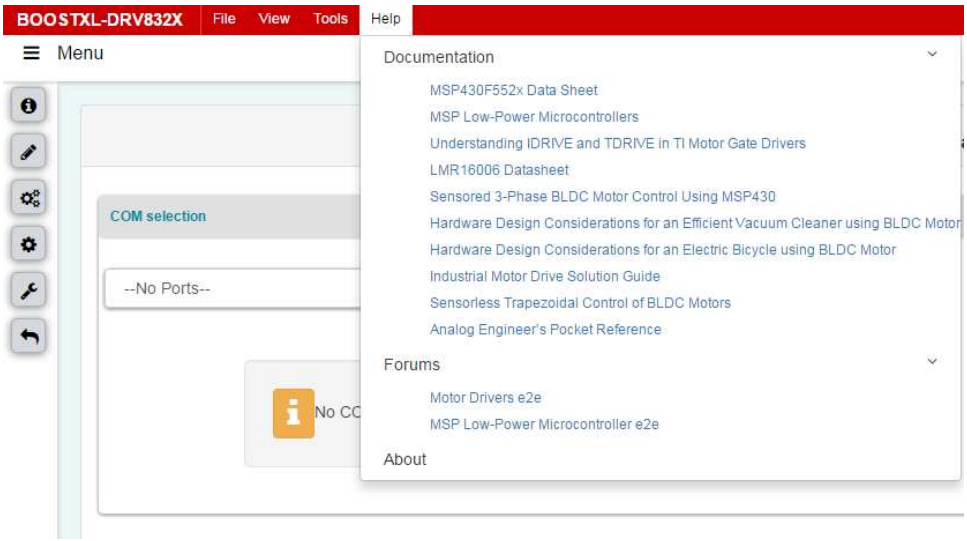

Figure 17. Toolbar—Help

The BOOSTXL-DRV832X EVM can be controlled by following these steps in the GUI application.

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