# DRV10983-Q1 Evaluation Module

This user's guide provides complete details of the customer evaluation module (EVM) for the DRV10983-Q1 device including hardware implementation, jumper configuration, and operating procedure to run 3-phase BLDC motors. This EVM user's guide is intended to be used with the *DRV10983-Q1 Tuning Guide* to optimally tune a user motor.

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# 1 DRV10983-Q1 EVM Kit Contents

The DRV10983-Q1 evaluation kit contains the following:

- DRV10983-Q1 EVM board
- USB2ANY communication board for I²C GUI interaction
- USB cable
- 10-pin ribbon cable to connect the USB2ANY and DRV10983-Q1 EVM
- DRV10983-Q1 EVM GUI

  The DRV10983-Q1 EVM boards and GUI are designed to work together to evaluate the device features.

# 2 Introduction

The DRV10983-Q1 EVM is a complete solution for evaluating the DRV10983-Q1, three-phase sensorless BLDC motor drivers. Device evaluation and configuration for specific applications is possible with the provided DRV10983-Q1 EVM GUI. This document describes the kit details and explains the functions and locations of test points, jumpers, and connectors present on the kit. This document is also a quick-start guide for using the GUI to tune a motor for application. For detailed information about the operating modes of the DRV10983-Q1 device, refer to the *DRV10983-Q1 Automotive, Three-Phase, Sensorless BLDC Motor Driver* data sheet.

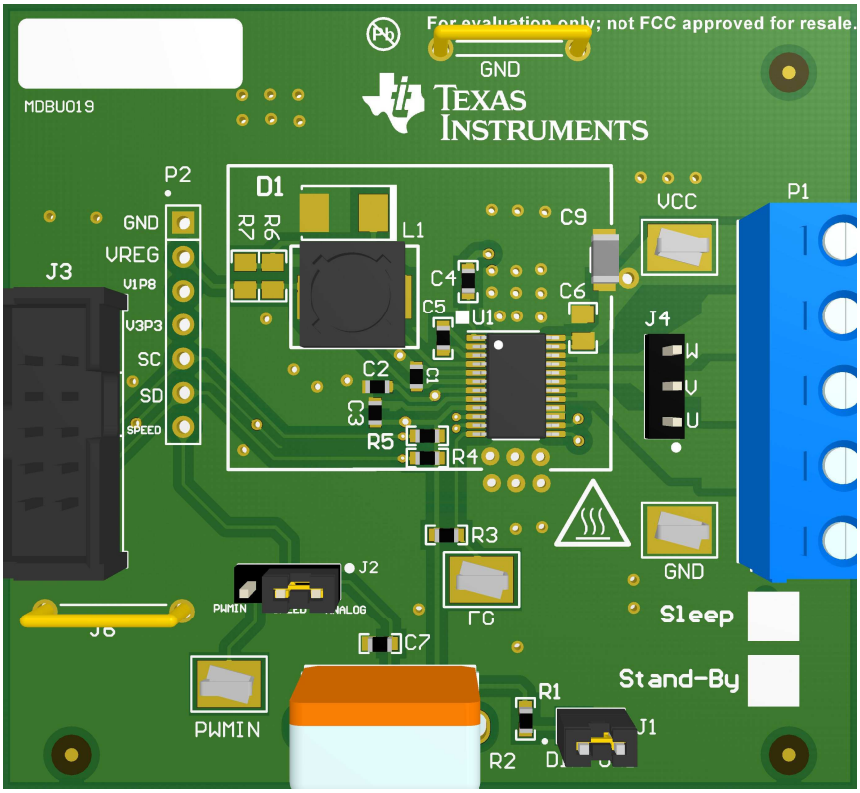



**Figure 1. DRV10983-Q1 EVM**

# 3 DRV10983-Q1 EVM Board

## 3.1 Power and Motor Connectors P1

The DRV10983-Q1 EVM shares terminal P1 for power supply and motor-phase output. Use a single power-supply rail between 6.2 V to 28 V to operate the EVM. Table 1 lists the pin assignment of terminal P1.

**Table 1. P1 Terminal Assignments**

| Pin | Description |
|---|---|
| 1 | VCC |
| 2 | W |
| 3 | V |
| 4 | U |
| 5 | GND |

## 3.2 Test Point Connector P2

The P2 connector can be used to measure signals from the DRV10983-Q1 device. P2 is not populated.Table 2 lists the pin assignment of terminal P2.

**Table 2. P2 Terminal Assignments**

| Pin | Description |
|---|---|
| 1 | GND |
| 2 | VREG |
| 3 | V1P8 |
| 4 | V3P3 |
| 5 | SC from J3 (connects to SCL of device) |
| 6 | SD from J3 (connects to SDA of device) |
| 7 | SPEED input from PWMIN or ANALOG (R2) |

## 3.3 Control Input Connectors J3

The J3 connector is used for the $I^2C$ interconnection with the GUI. Table 3 lists the pin assignment of terminal J3.

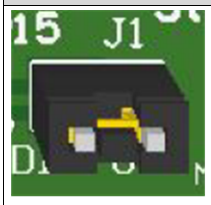
**Table 3. J3 Terminal Assignments**

| Pin | Description |
|---|---|
| 6 | GND |
| 9 | SD (connects to SDA of device) |
| 10 | SC (connects to SCL of device) |

### 3.4 Jumper J1 (Direction)

To control the spin direction of the motor, the DRV10983-Q1 EVM is equipped with a direction jumper. Depending if 3V3 or GND is supplied to the DRV10983-Q1 direction input, the motor spins either in forward or reverse direction.

**Table 4. DIR PIN Setting**

| J1 Connection | | Description |
|---|---|---|
|  | Unconnected | DIR is set to 3.3 V |
| | Connected | DIR is set to GND (shown) |

### 3.5 Jumper J2 (Speed Input)

The motor speed input source is configured with J2. If J2 pins 2-3 is populated, supply a PWM to the PWMIN test pin to control the motor speed. If J2 pins 1-2 is populated, the motor speed is controlled with the analog potentiometer R2 equipped on the EVM.

**Table 5. SPEED Pin Setting**

| J2 Connection | | Description |
|---|---|---|
|  | 1-2 | Analog potentiometer R2 (shown) |
| | 2-3 | PWMIN digital input |

**NOTE:** The motor operation can be unpredictable if the internal register setting the DRV10983-Q1 device does not match the J2 selection.

### 3.6 FG Test Pin

The frequency generator (FG) test pin outputs the motor speed, depending on the internal DRV10983-Q1 divider setting and the number of motor poles.

# 4 DRV10983-Q1 GUI

## 4.1 Overview

The DRV10983-Q1 EVM is provided with a GUI to configure the device and tune the application. See Appendix A for instructions to download and install the GUI application. The GUI is structured into three tabs (*Basic Settings*, *Advanced Settings*, and *Display*) allowing configuration of the register settings and tuning of the device parameters for the target application. For details about the settings, refer to the *DRV10983-Q1 Automotive, Three-Phase, Sensorless BLDC Motor Driver* data sheet.

The following sections include DRV10983-Q1 GUI images to explain the various features of the GUI.

## 4.2 Basic Settings

The *Basic Settings* tab is the landing screen after launching the GUI on the computer. The tab sets the motor parameters, startup parameters, initial speed detection prior to startup, and current limits. This tab can also load and save motor parameters and program the EEPROM with optimized settings.

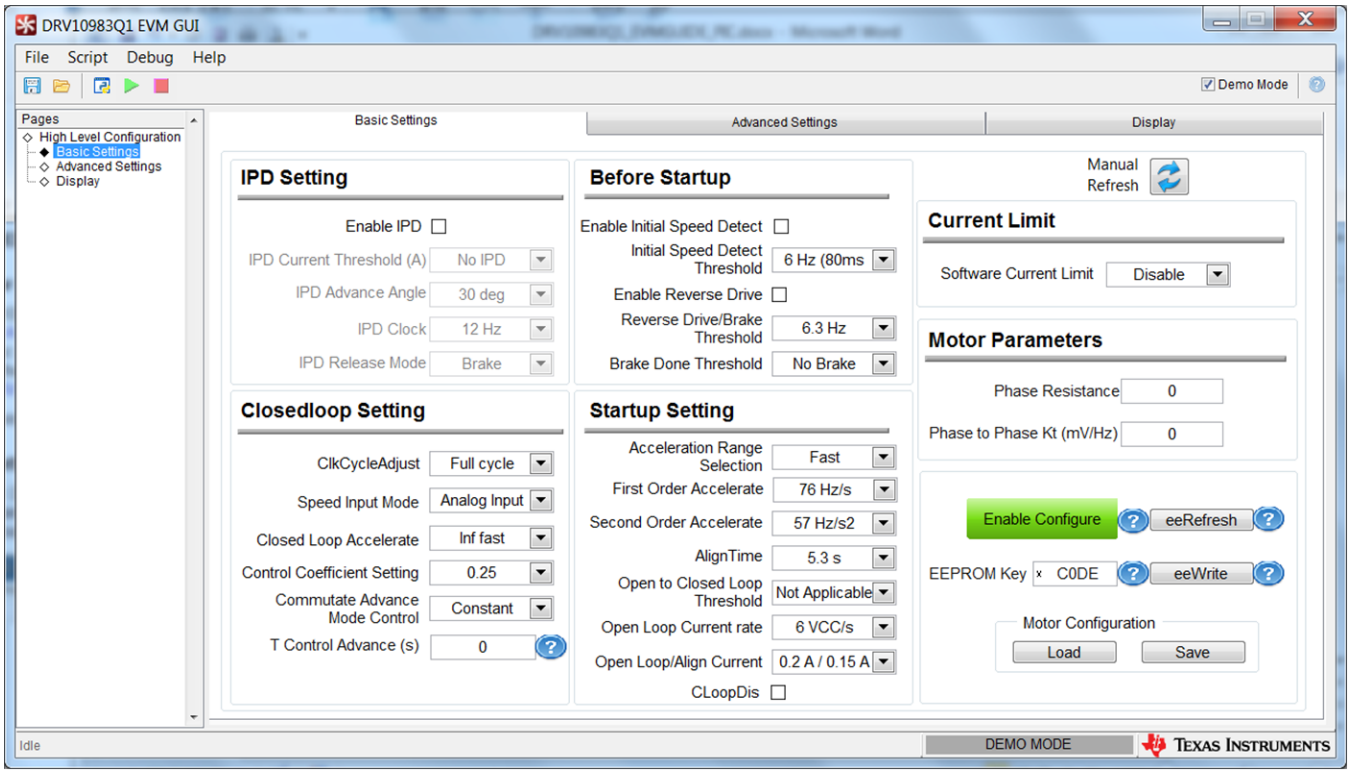



**Figure 2. DRV10983-Q1 GUI Basic Settings**

### 4.2.1 Communication

The GUI is designed to work with and without the hardware connected, allowing evaluation of the available settings. Click the *Demo Mode* checkbox in the top right to work offline when the box is checked. When the EVM is connected to the GUI, this box should be unchecked and the status bar in the bottom right displays *Connected*. If the GUI cannot connect to the hardware, check that the hardware is powered and the $I^2C$ communication is correctly established.

### 4.2.2 Register Access – Enable Configure

To access the register settings, click the *Enable Configure* button (see Figure 2). When selected, the button changes from the default gray to green, and the settings can be changed.

### 4.2.3 Changing Register Settings

The GUI supports three different input types to set the register values which are defined as follows:

**Dropdown menu —** This menu provides a list to select a predefined setting as shown in Figure 3.

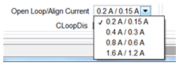



**Figure 3. Example Dropdown Menu**

**Checkbox —** Select this checkbox to set single bit values. Figure 4 shows the checkbox enabled.

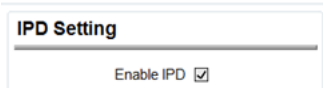



**Figure 4. Example Checkbox**

**Text box —** The text box allows users to input data that might be changed by the device because of the data type conversations. In Figure 5, a value of 1.5 was entered and the nearest value, 1.552, was selected.

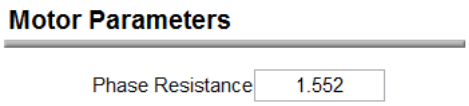



**Figure 5. Example Text Box**

### 4.2.4 Work With EEPROM

The settings are saved and loaded using the *Save* and *Load* buttons on the *Basic Settings* tab. When saved, the file is written as a .csv file that can be loaded at a later time.

To program the DRV10983-Q1 devices and change the default EEPROM settings, follow the instructions listed in the *DRV10983-Q1 Automotive, Three-Phase, Sensorless BLDC Motor Driver* data sheet.

### 4.2.4.1 Advanced Settings

The *Advance Settings* tab controls functions such as lock detection, anti-voltage surge (AVS), dead time, PWM frequency, Current Limit for Lock Detection, slew rate, Duty Cycle Limit, spread-spectrum modulation, and Temp Warning Action.

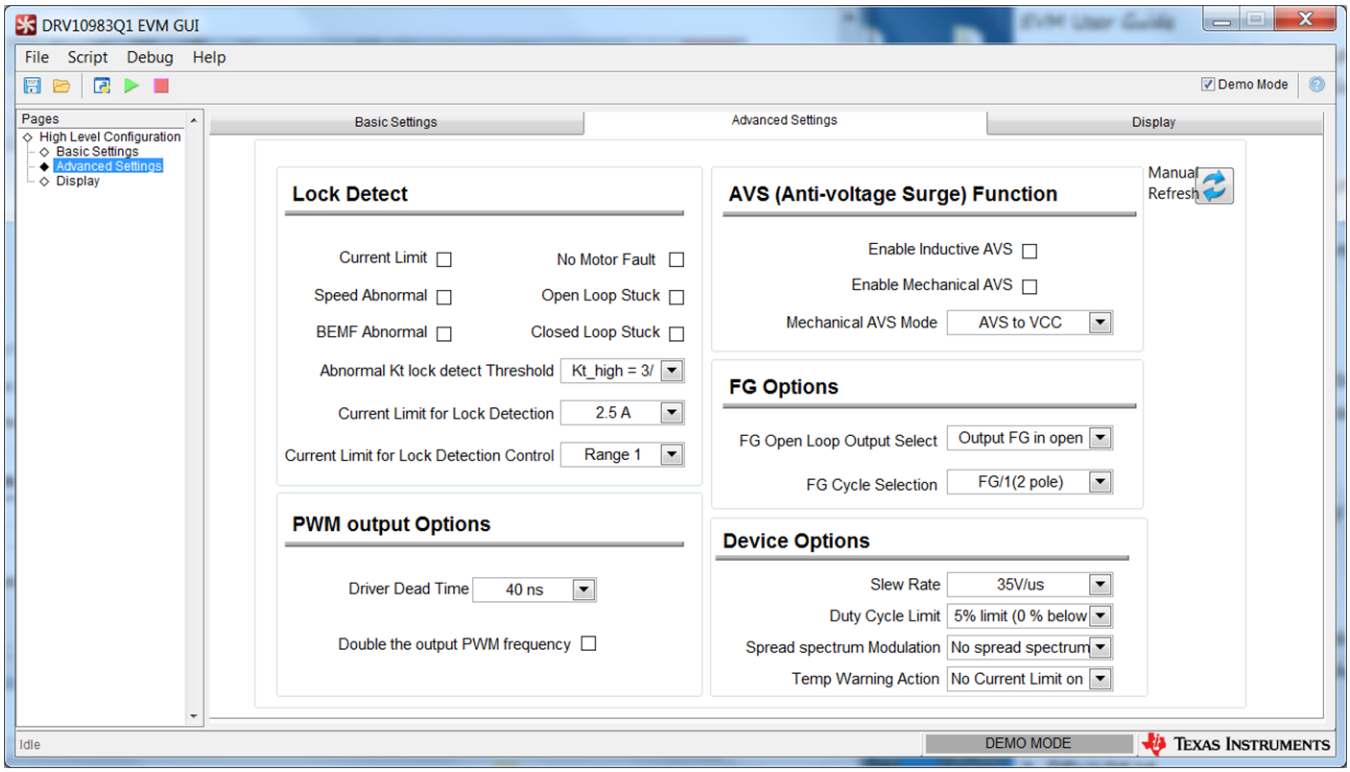



**Figure 6. DRV10983-Q1 GUI Advanced Settings**

#### 4.2.4.2 Display

The *Display* tab monitors the device status and motor parameters.

The left section of the *Display* tab (also called *Display*) shows all motor parameters. The parameters can be refreshed manually, or automatically every second.

**NOTE:** Auto refresh may slow communication with the device.

The right section of the *Display* tab shows the device status. An active fault condition lights the red indication.

Control the motor speed from the GUI with the speed control options in the bottom section of the *Display* tab. To control the motor speed using the GUI, check the OverRide bit and set the motor speed from 0 to 511 decimal. To disable Motor Operation, check the Disable Motor Operation bit.

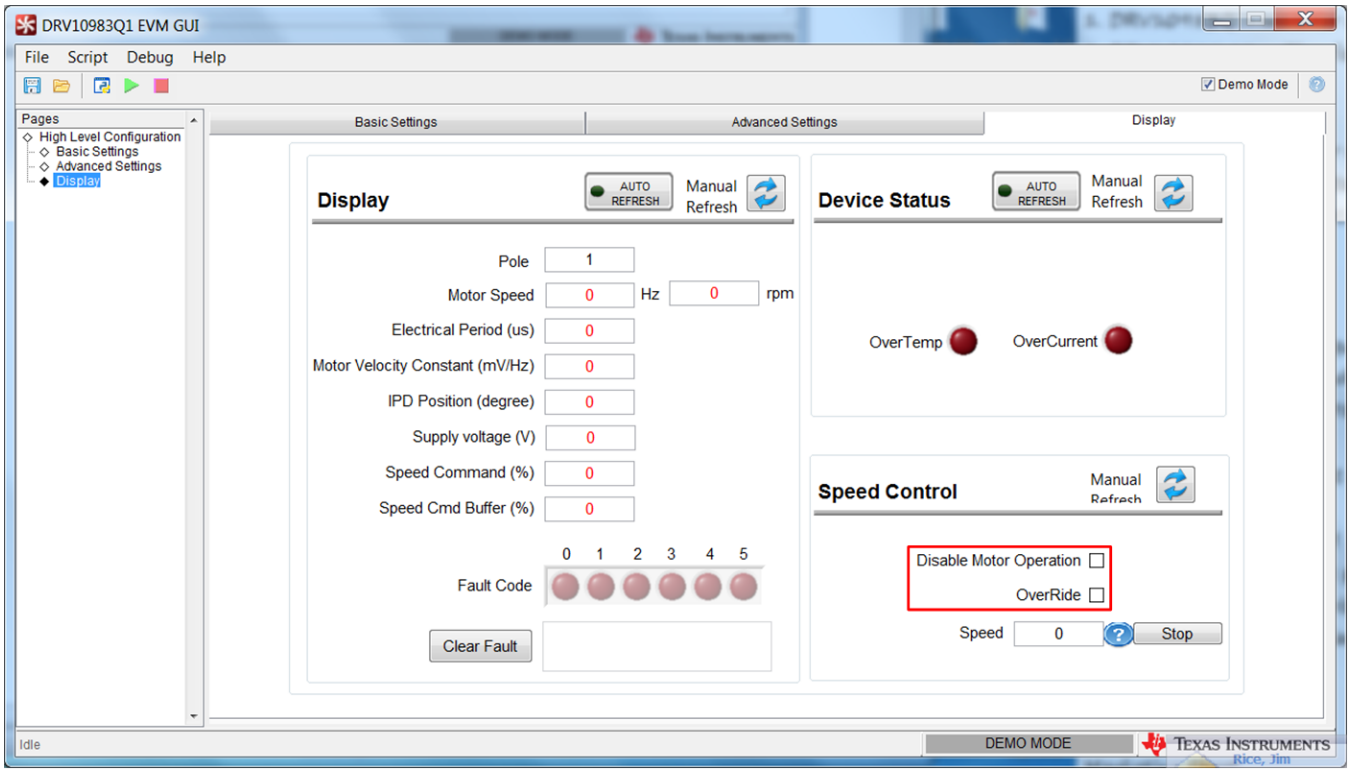



**Figure 7. DRV10983-Q1 GUI Display Settings**

# 5 Out-of-the-Box Quick-Start Guide

This section assumes that the user has already downloaded the DRV10983-Q1 application GUI as mentioned in Appendix A.

Perform the following procedure to confirm proper operation of the EVM kit:

Step 1. Do not connect the motor phases and ensure that jumper J2 is set to *Analog*.

Step 2. Set the speed input to 0 by rotating the potentiometer R2 fully counterclockwise. If the DRV10983Q Sleep mode device replaces the device in the EVM, set the speed input to maximum by rotating the potentiometer R2 fully clockwise, and skip step 3.

Step 3. Connect the motor phases of the user motor to connector P1. Phase sequence is not important as it only determines the direction of rotation.

Step 4. Connect the USB2ANY board to the computer using the supplied USB cable.

Step 5. Connect the 10-pin ribbon cable header to J4 on the USB2ANY board and J3 on the DRV10983-Q1 EVMs.

Step 6. Connect a power supply to VCC (pin1) and GND (pin 5) of connector P1.

**WARNING**

**Caution Hot surface. Contact may cause burns. Do not touch.**

Step 7. Power on the EVM VCC by applying 12 V.

**CAUTION**

With VCC, never exceed 45 V on the DRV10983-Q1 EVMs during motor operation.

Step 8. Launch the DRV109XXEVM.exe application on the computer (see Appendix A).

Step 9. Select the appropriate device configuration as shown in Figure 8.

Step 10. Click the *OK* button.

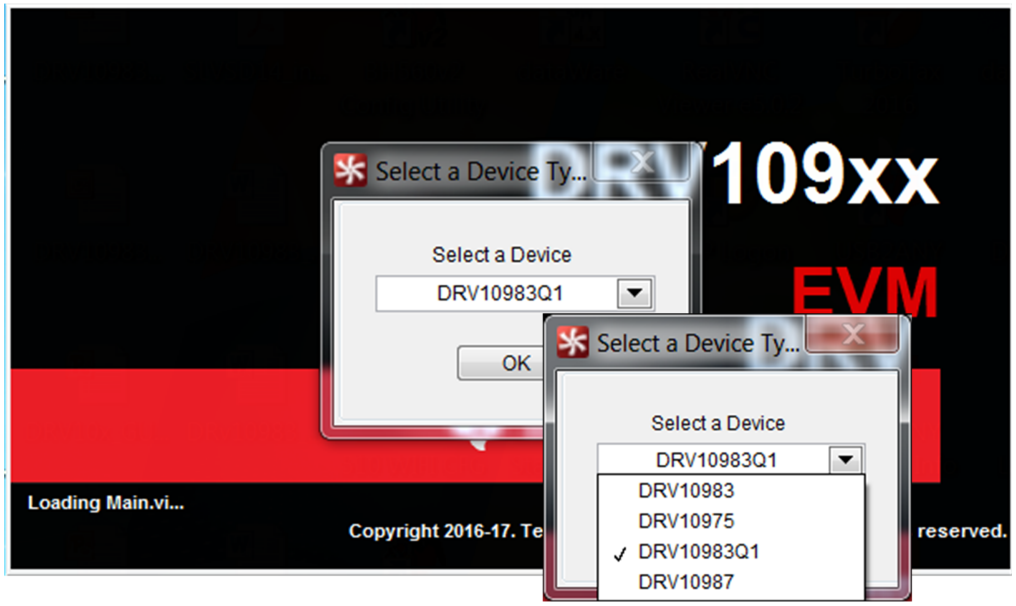



**Figure 8. Initial GUI Screen**

- If no hardware is connected, or if a hardware connection problem occurs, the GUI displays the error message as shown in Figure 9. Confirm the hardware connection. Retry the initialization or click the *Demo Mode* button to operate in demo mode.

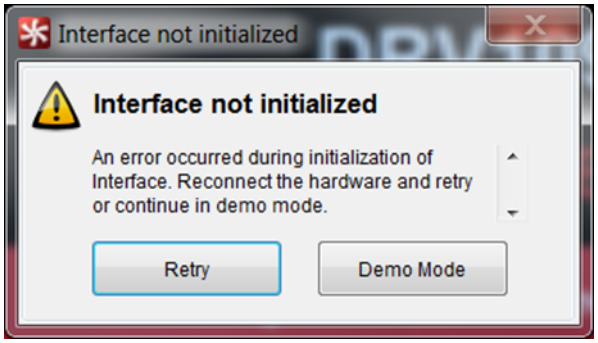



**Figure 9. Initial GUI Screen**

- If the *Demo Mode* button was clicked, the GUI displays the *Basic Settings* as shown in Figure 10. Click the *Demo Mode* checkbox to deselect the demo mode communication and proceed to step 11.
- If the *Retry* button was selected, the GUI displays the screen as shown in Figure 11 directly after step 10.

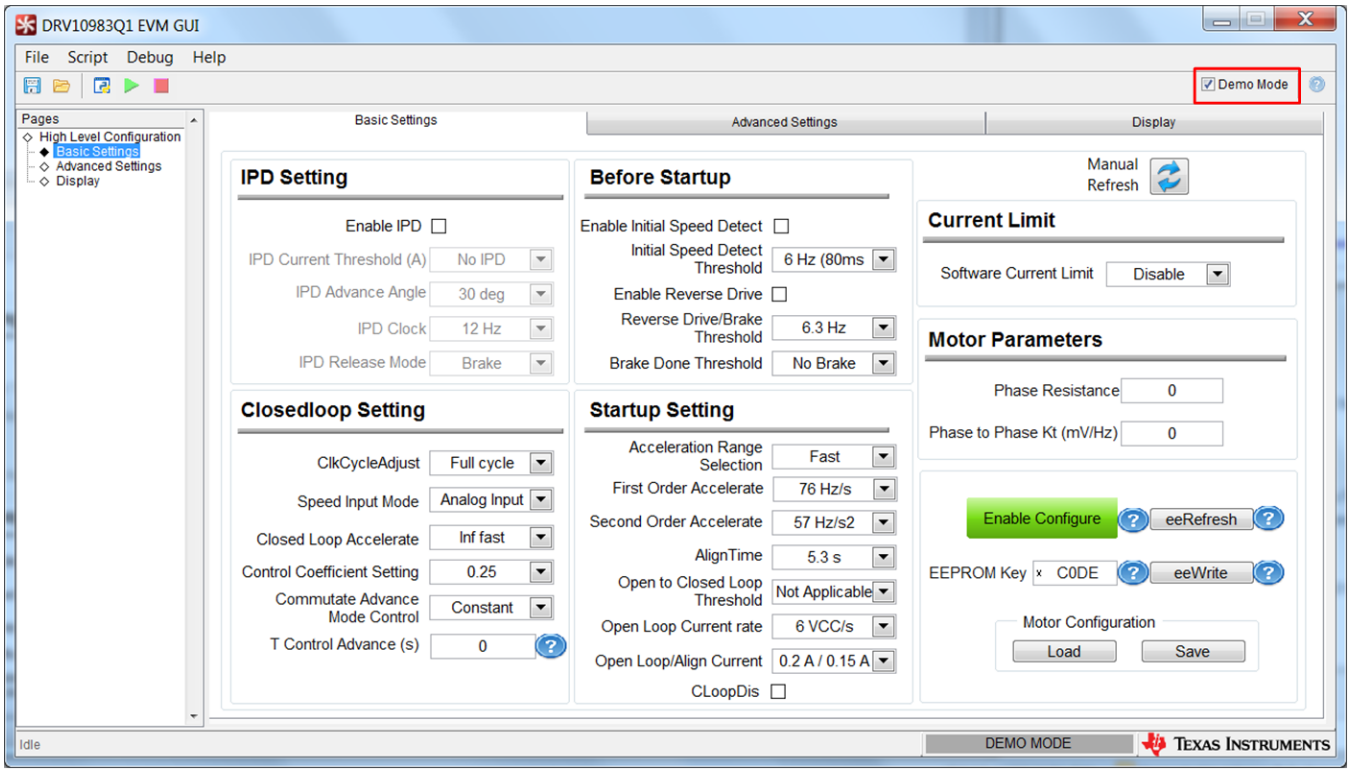



**Figure 10. GUI in Demo Mode**

Step 11. The status bar displays *HARDWARE CONNECTED* and the bar turns green, indicating that the GUI is communicating with the device. Click the *Enable Configure* to change this button from the red to green (see Figure 11).

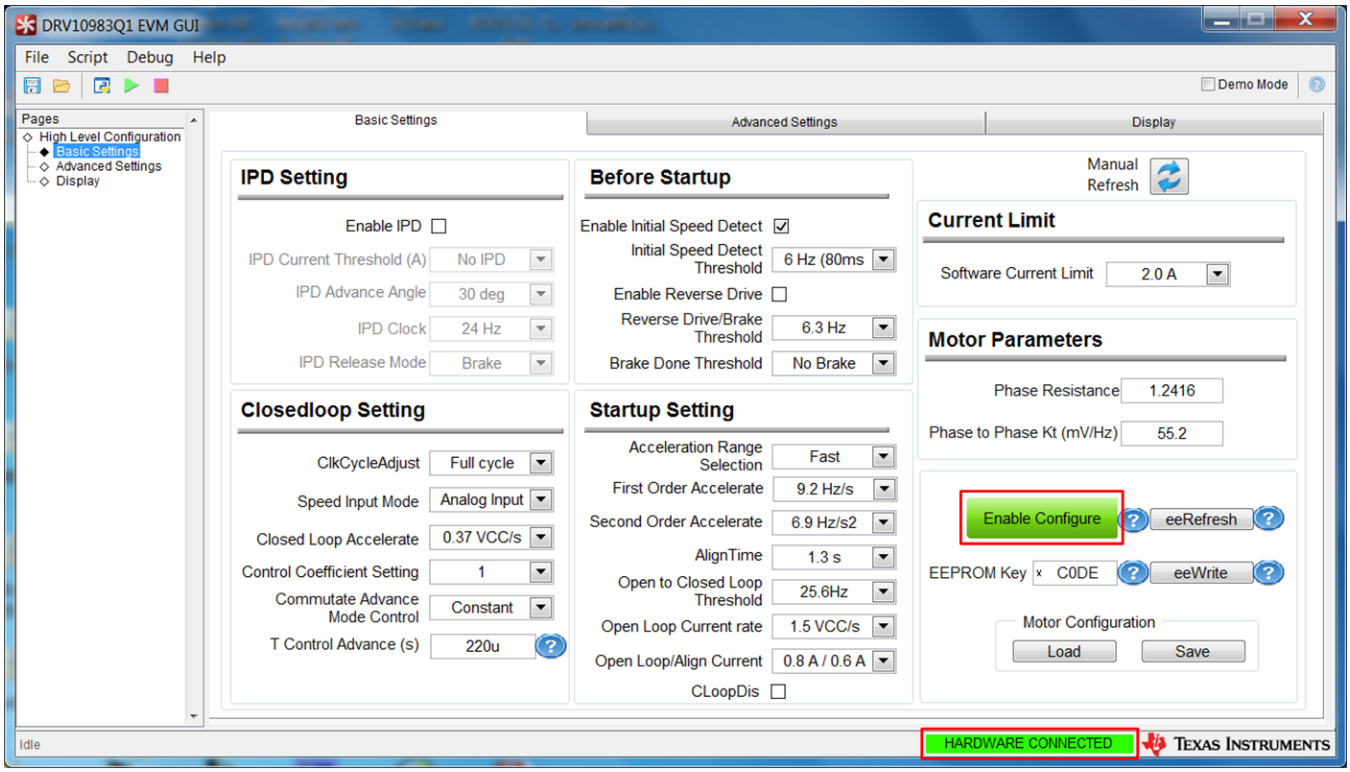



**Figure 11. Enable Configure**

Step 12. The *Display* tab provides fault code information.

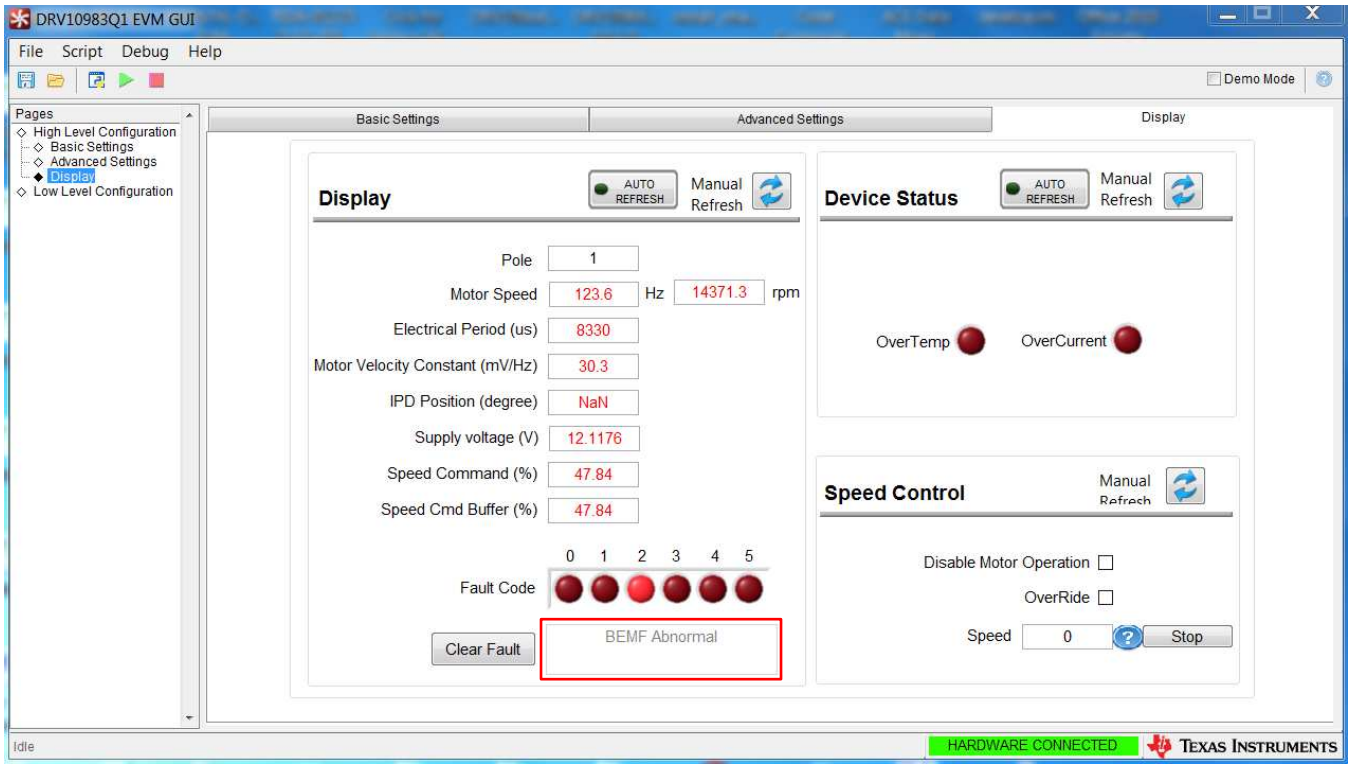



**Figure 12. Fault Code Information**

In PWM input mode, the motor speed increase as increasing PWM duty cycle, and the motor speed decrease as decreasing PWM duty cycle. In analog input mode, the motor speed increases as the potentiometer R2 is turned clockwise, and decreases as R2 is turned counter clockwise. Check the Disable Motor Operation bit, load, or change desired parameter information, then uncheck the Disable Motor Operation bit. If the DRV10983Q Sleep mode device replaces the device in the EVM, connect the motor phases of the user motor to the P1 connector before unchecking the Disable Motor Operation bit.

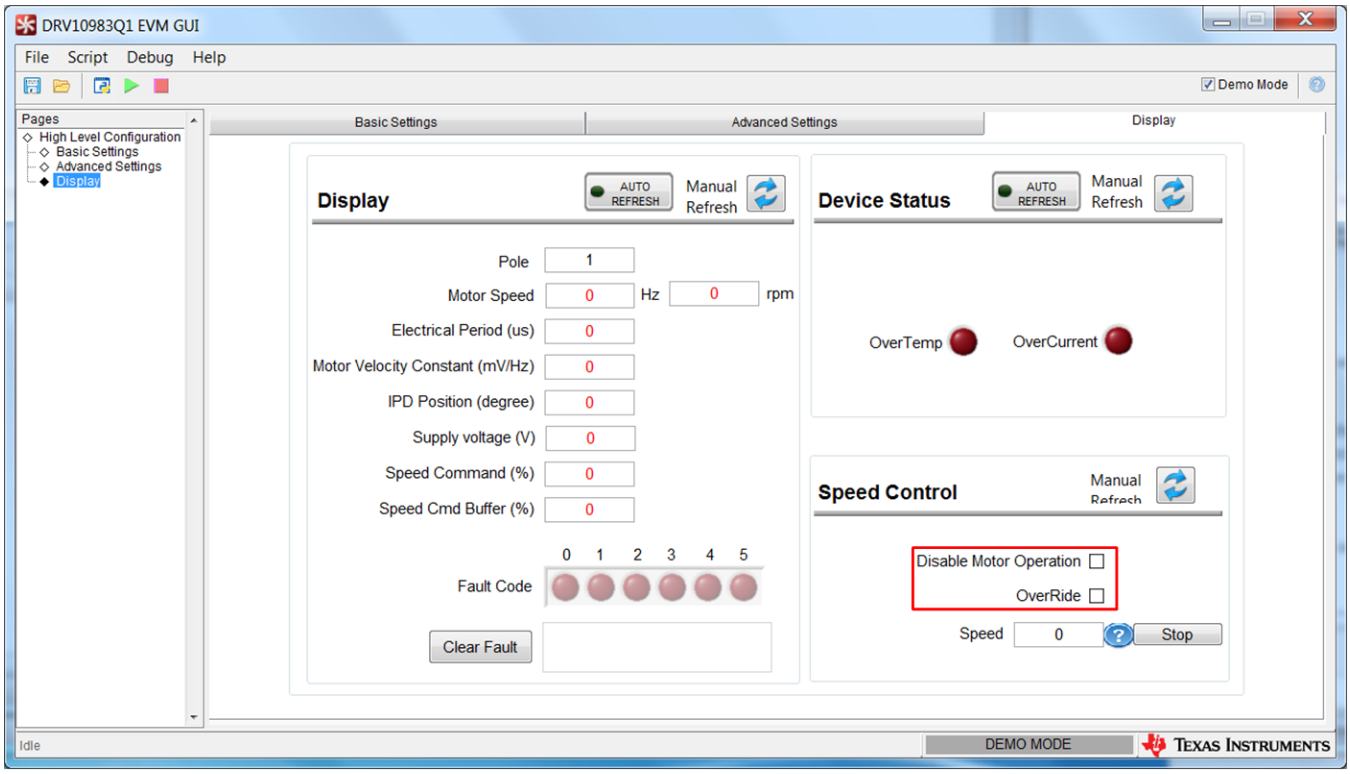



**Figure 13. Disabled Motor Operation Selected**

Step 13. Change the motor direction by connecting or removing jumper J1.

Step 14. Switch to the *Display* tab and select the *OverRide* checkbox to override the PWM or analog voltage speed control.

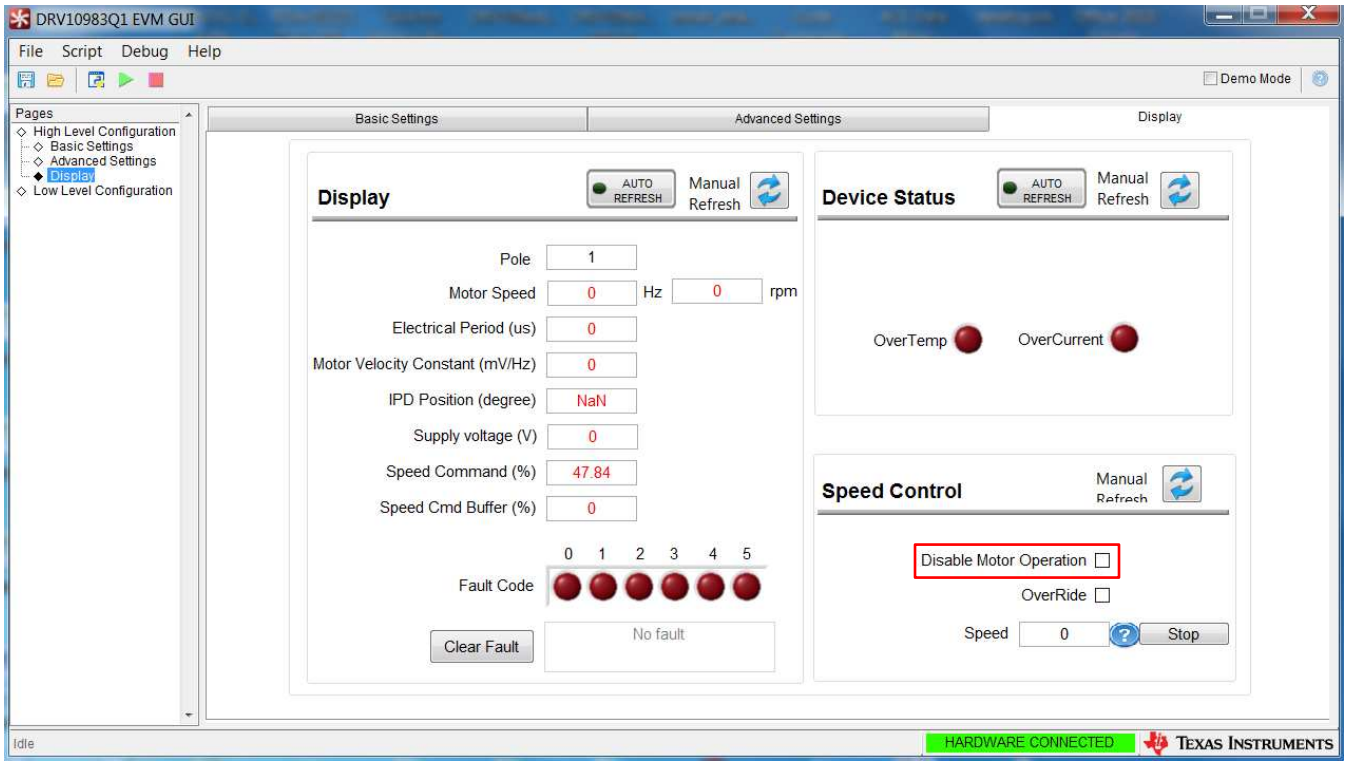



**Figure 14. OverRide Selected**

Step 15. Enter values from 0 (stopped) to 511 (full speed) in the *Speed* text box to control the speed.

Step 16. When complete, enter a value of 0 in the *Speed* text box and deselect the *OverRide* checkbox.

## 6 Power-On Sequence and Connection With User Specific Motor

The DRV10983-Q1 EVMs are shipped with default EEPROM settings for all registers, which may or may not be suitable to operate the target motor. To connect the user motor to the EVM, follow the steps listed in Section 5 to avoid any damage to the EVM.

To successfully tune a user motor, refer to the *DRV10983-Q1 Tuning Guide*.

## 7 Schematic and Bill of Materials

This section contains the DRV10983-Q1 schematic and bill of materials (BOM).

### *7.1 Schematic*

Figure 15 shows the DRV10983-Q1 schematic.

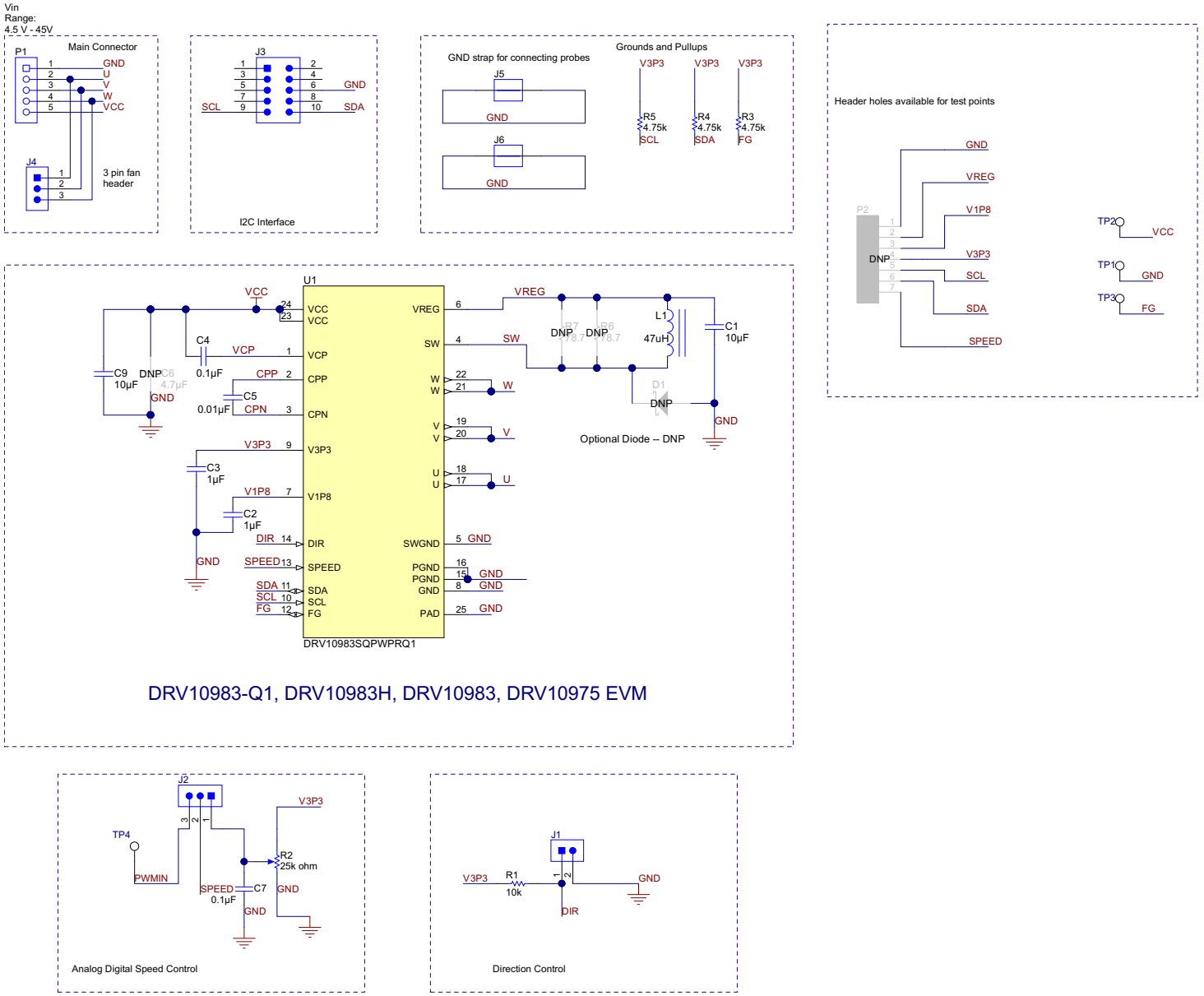





**Figure 15. DRV10983-Q1 Schematic**

## 7.2 Bill of Materials (BOM)

Table 6 lists the DRV10983-Q1 EVM bill of materials.

**Table 6. DRV10983-Q1 Bill of Materials**

| Designator | Description | Manufacturer | Part Number | Quantity |
|---|---|---|---|---|
| !PCB[1] | Printed Circuit Board | TI | DRV10983Q1 | 1 |
| C1 | CAP, CERM, 10uF, 10V, ±20%, X5R, 0603 | TDK | C1608X5R1A106M | 1 |
| C2, C3 | CAP, CERM, 1uF, 25V, ±10%, X5R, 0603 | TDK | C1608X5R1E105K080AC | 2 |
| C4, C7 | CAP, CERM, 0.1uF, 50V, ±10%, X7R, 0603 | AVX | 06035C104KAT2A | 2 |
| C5 | CAP CERM, 10000PF, 50V X7R 0603 | AVX | 06035C103KAT2A | 1 |
| C9 | CAP, CERM, 10uF, 50V, ±10%, X5R, 1206 | TDK | C2012X5R1H475K125AB | 1 |
| H9, H10, H11, H12 | Bumpon, Hemisphere, 0.44 X 0.20, Clear | 3M | SJ-5303 (CLEAR) | 4 |
| J1 | Header, 100mil, 2x1, Tin plated, TH | Molex | 90120-0122 | 1 |
| J2, J4 | Header, 100mil, 3x1, Tin plated, TH | Sullins Connector Solutions | PEC03SAAN | 2 |
| J3 | Header (shrouded), 100mil, 5x2, Gold, TH | TE Connectivity | 5103308-1 | 1 |
| J5, J6 | 1mm Uninsulated Shorting Plug, 10.16mm spacing, TH | Harwin | D3082-05 | 1 |
| L1 | Inductor, Shielded, Ferrite, 47 µH, 1.15 A, 0.3 ohm, AEC-Q200 Grade 1, SMD | Wurth Elektronik | 784777470 | 1 |
| P1 | Terminal Block, 5.08 mm, 5x1, Brass, TH | On-Shore Technology | ED120/5DS | 1 |
| R3, R4, R5 | RES, 4.75k ohm, 1%, 0.1W, 0603 | Vishay-Dale | CRCW06034K75FKEA | 3 |
| R2 | Trimmer, 25k ohm, 0.15W, TH | CTS Electrocomponents | 296XD253B1N | 1 |
| R1 | RES, 10k ohm, 5%, 0.1W, 0603 | Vishay-Dale | CRCW060310K0JNEA | 1 |
| SH-J1, SH-J2 | Shunt, 100mil, Gold plated, Black | 3M | 969102-0000-DA | 2 |
| TP1, TP2, TP4 | Test Point, Compact, SMT | Keystone | 5016 | 3 |
| TP3 | Test Point, Compact, SMT | Keystone | 5016 | 1 |
| U1 | Automotive, Three-Phase, Sensorless BLDC Motor Driver, PWP0024B | Texas Instruments | DRV10983PWP-Q1 | 1 |

(1) U1 part number is DRV10983-Q1.

# GUI Installation and Overview

This appendix section explains the location and the procedure for installing the software.

**NOTE:** Ensure that no USB connections are made to the EVM until the installation is completed.

## A.1 System Requirements

The system requirements are as follows:

- Supported OS: Microsoft® Windows® XP, Windows 7 (32 bit, 64 bit)
- Recommended RAM memory: 4GB or higher
- Recommended CPU operating speed: 3.3 GHz or higher

## A.2 Installation Procedure

The following procedure describes how to install the DRV109xxEVM GUI. The installer also installs Python 2.7, USB2ANY SDK along with the GUI installation.

1. Double click on the Setup_DRV109xx_EVM.exe from the *DRV109xx* folder as shown in Figure 16.

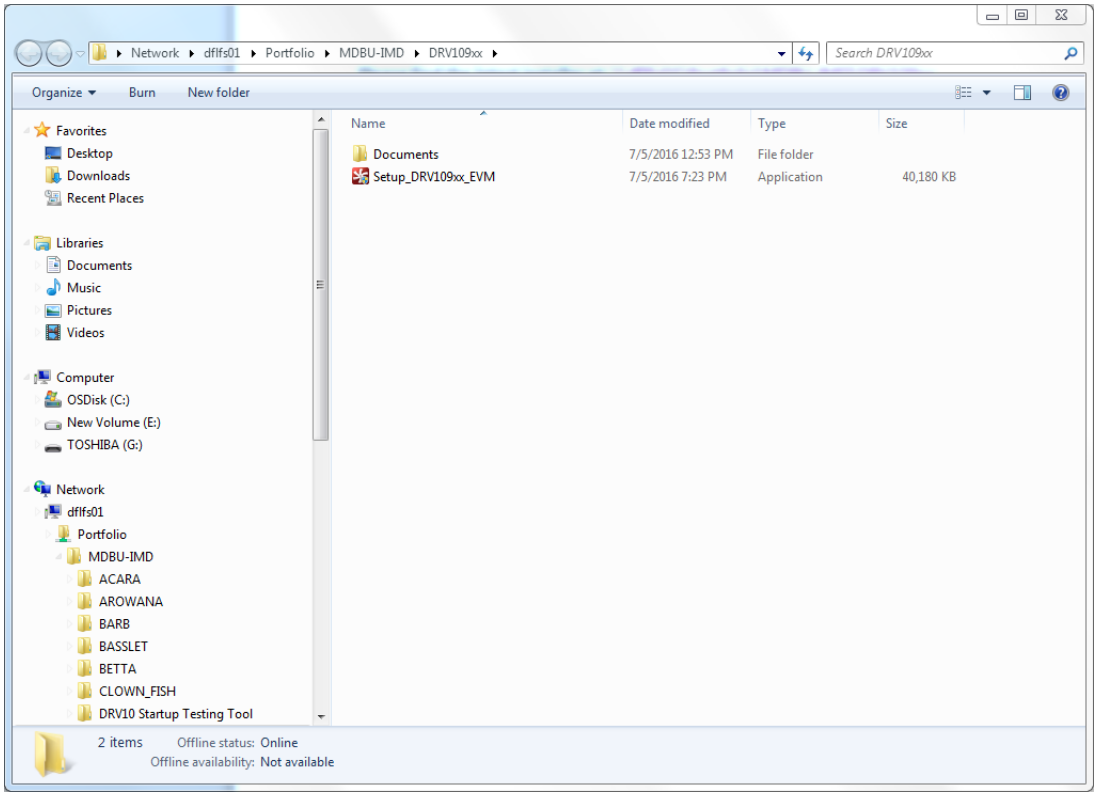



**Figure 16. Setup_DRV109xx_EVM.exe from the Volume Folder**

2. The *Setup* window is displayed as shown in Figure 17. Click the *Next* > button to begin the setup

wizard.

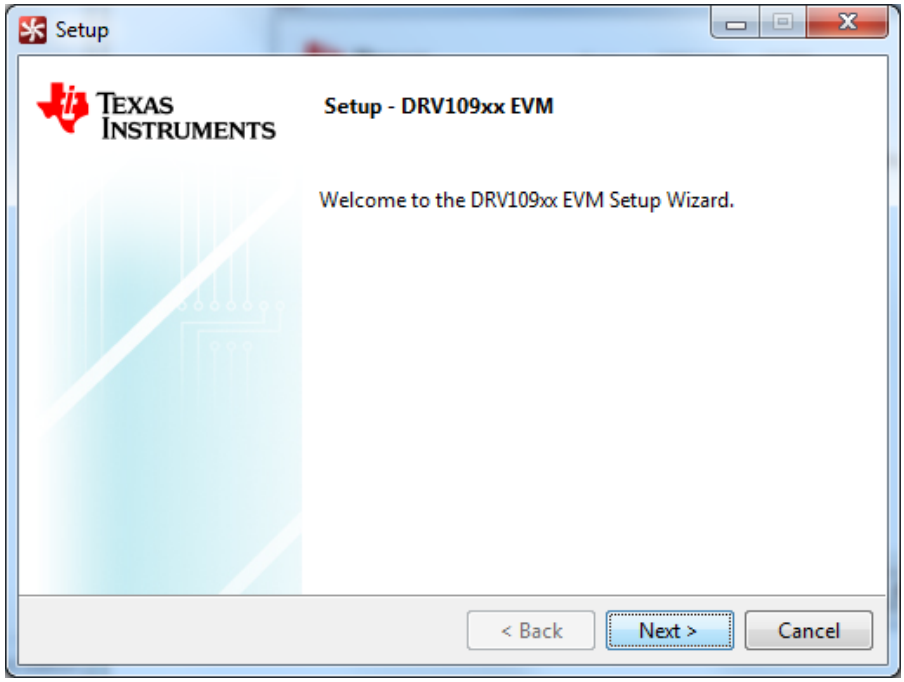



**Figure 17. GUI Installation Initialization**

3. The license agreement is displayed next as shown in Figure 18. Read through the agreement carefully and select the *I accept the agreement* radio button and then click the *Next >* button to proceed to the next step.

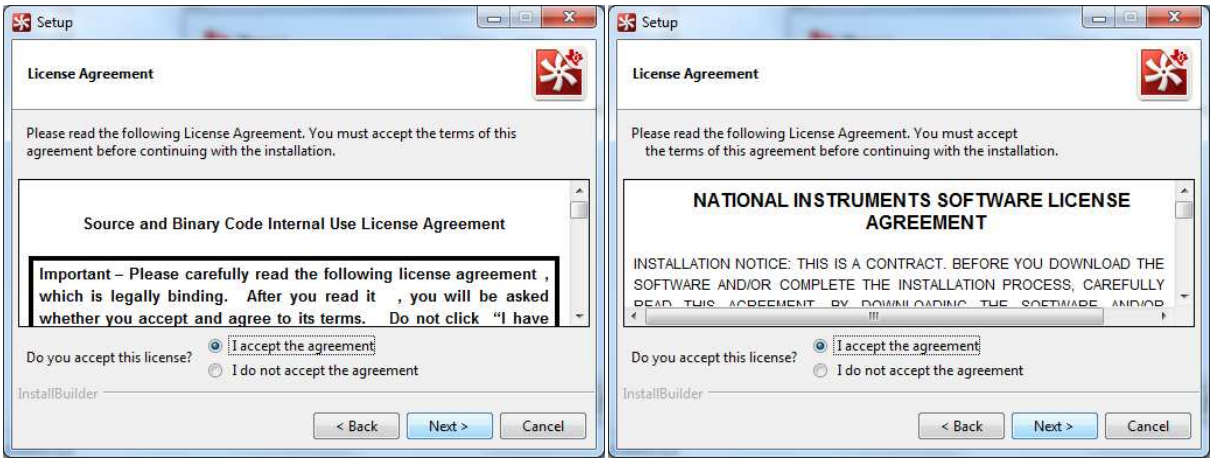



**Figure 18. License Agreement**

4. Set the destination directories for the GUI installation and click the *Next* > as shown in Figure 19. TI recommends to keep the default values as provided in the installer.

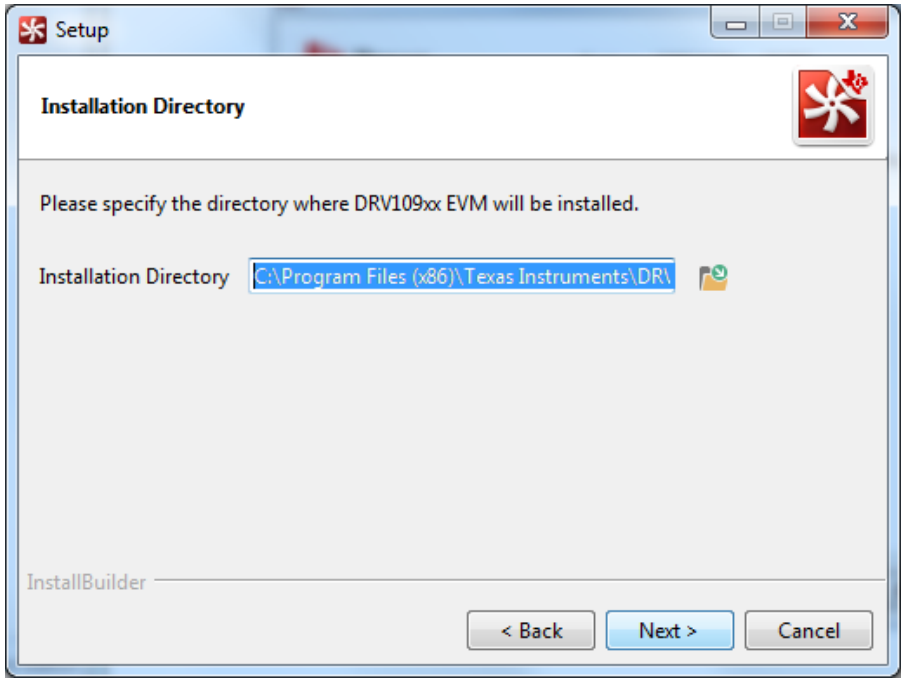



**Figure 19. GUI Destination Directory**

5. The *Ready to Install* window appears next as shown in Figure 20. Click the *Next* > to begin installation.

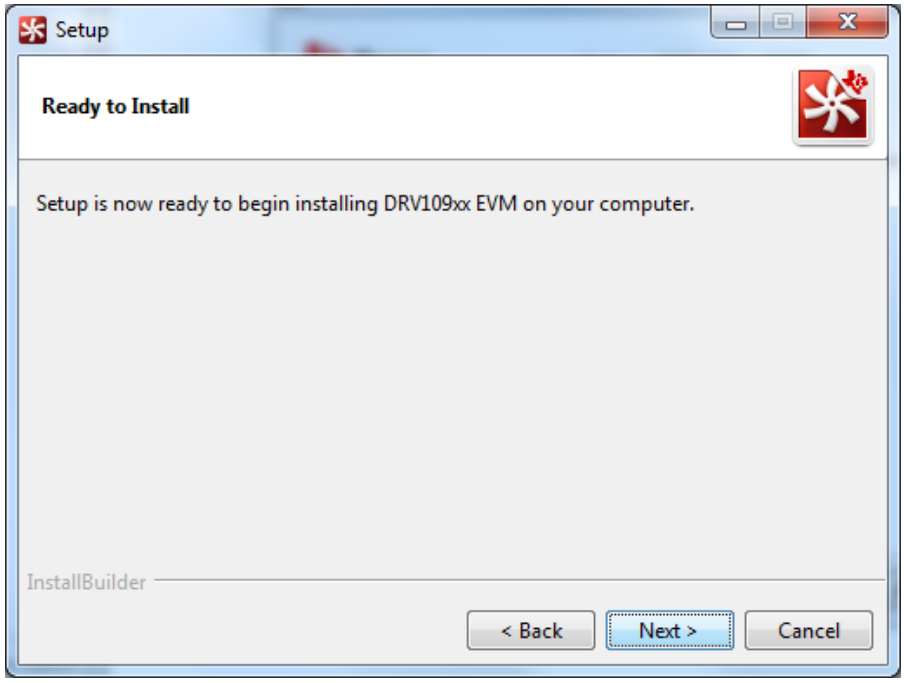



**Figure 20. GUI Start Installation**

6. The installer begins self-extraction and proceeds with the installation as shown in Figure 21.

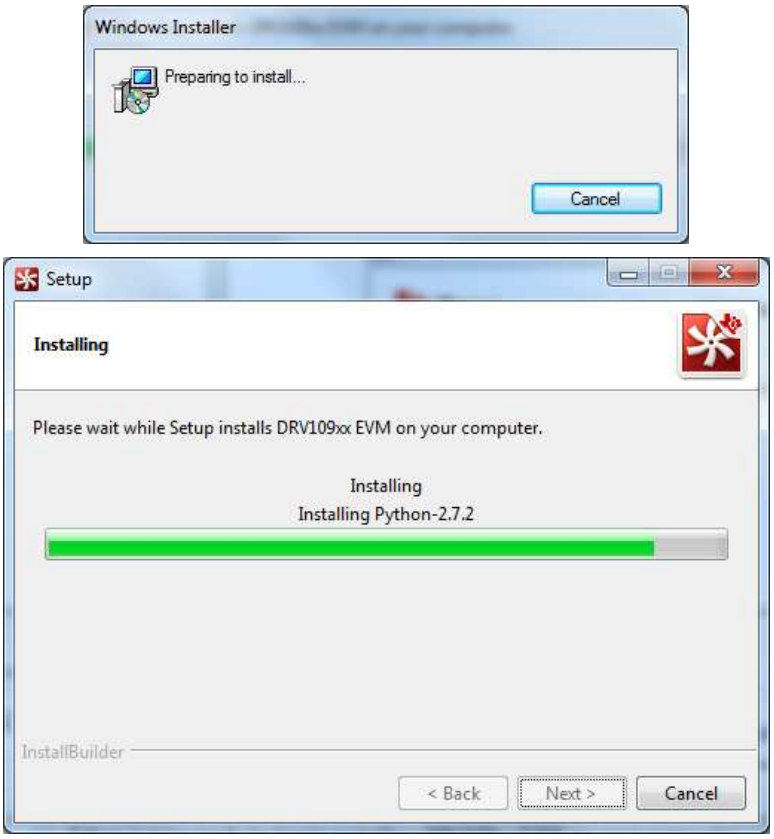



**Figure 21. GUI Installation in Progress**

7. After the installation of the GUI, the Python installation initiates. When Python is installed, a the window shown in Figure 22 is displayed. Click the *Finish* button to proceed with the USB2ANY installation.


**Figure 22. Python Installation Complete**

8. The setup window for the USB2ANY installation is displayed as shown in Figure 23. Click the *Next* > button to proceed with the initialization.

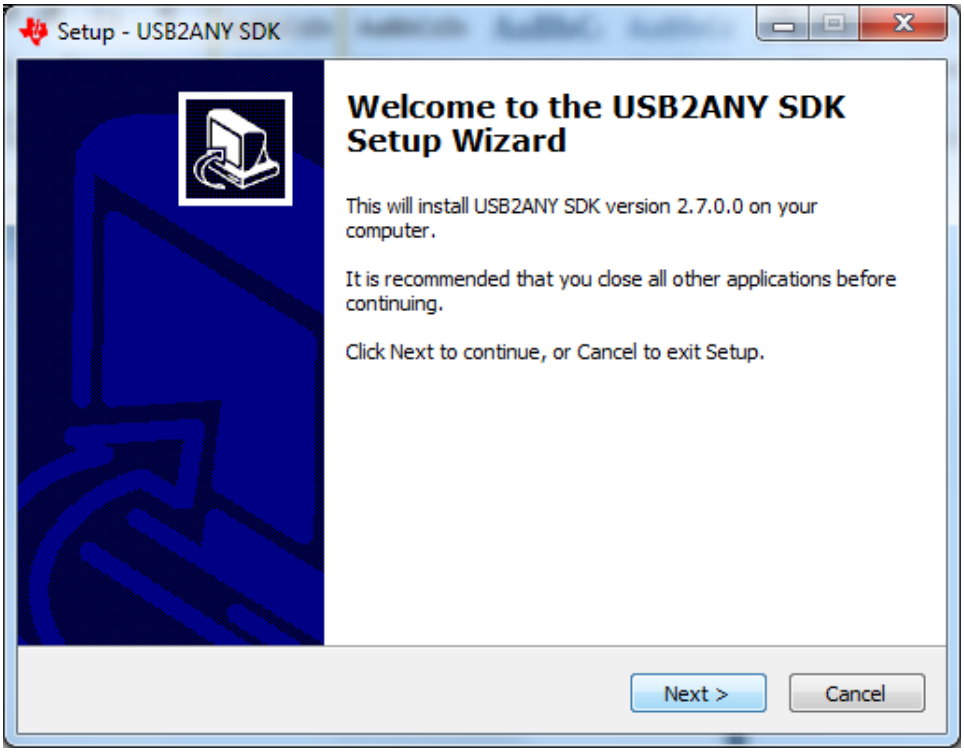



**Figure 23. USB2ANY Installation Initialization**

9. The license agreement is displayed next as shown in Figure 24. Read through the agreement carefully and select the *I accept the agreement* radio button and then click the *Next* > button to proceed.

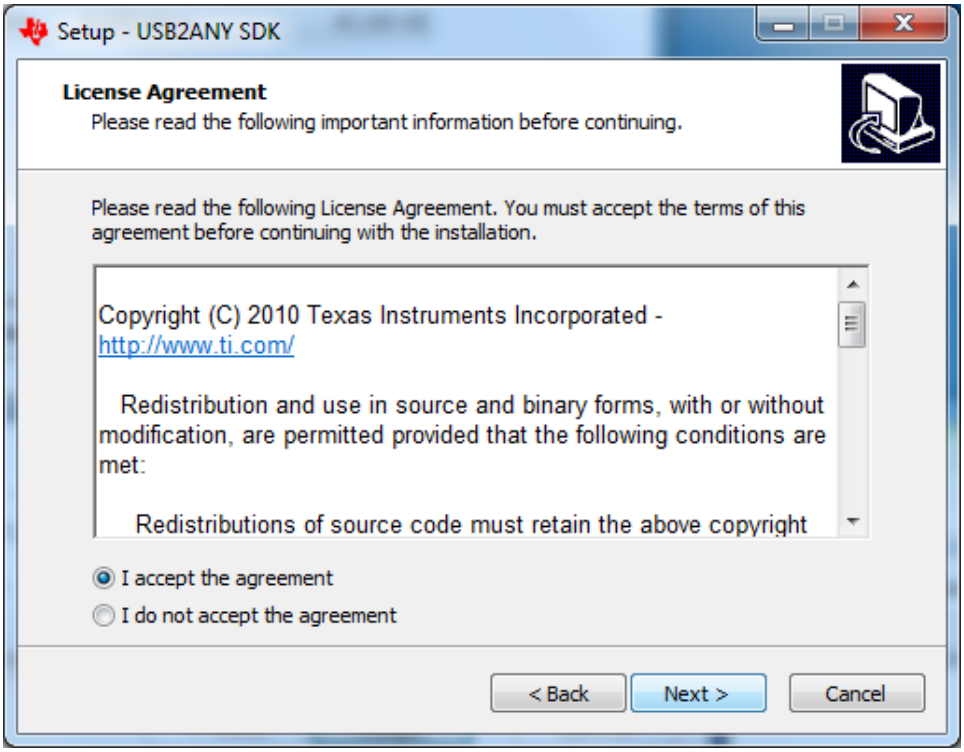



**Figure 24. USB2ANY License Agreement**

10. Set the destination directories for the USB2ANY installation and click the *Next* > as shown in Figure 25.

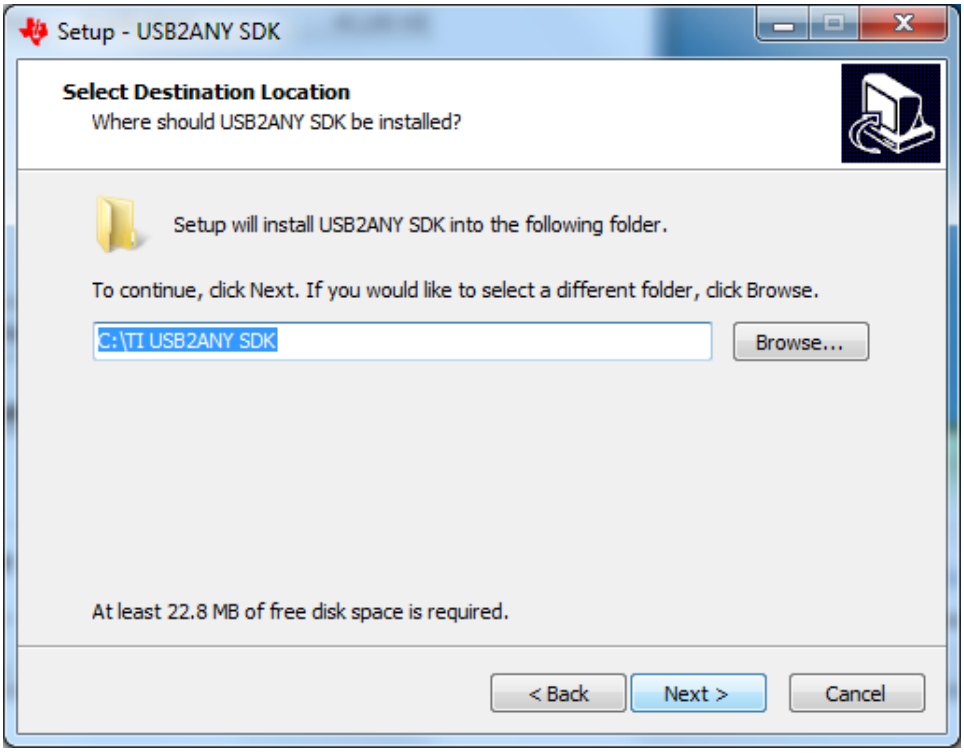



**Figure 25. USB2ANY Destination Directory**

11. The *Ready to Install* window is displayed next as shown in Figure 26. Click the *Install* button to begin the USB2ANY installation.

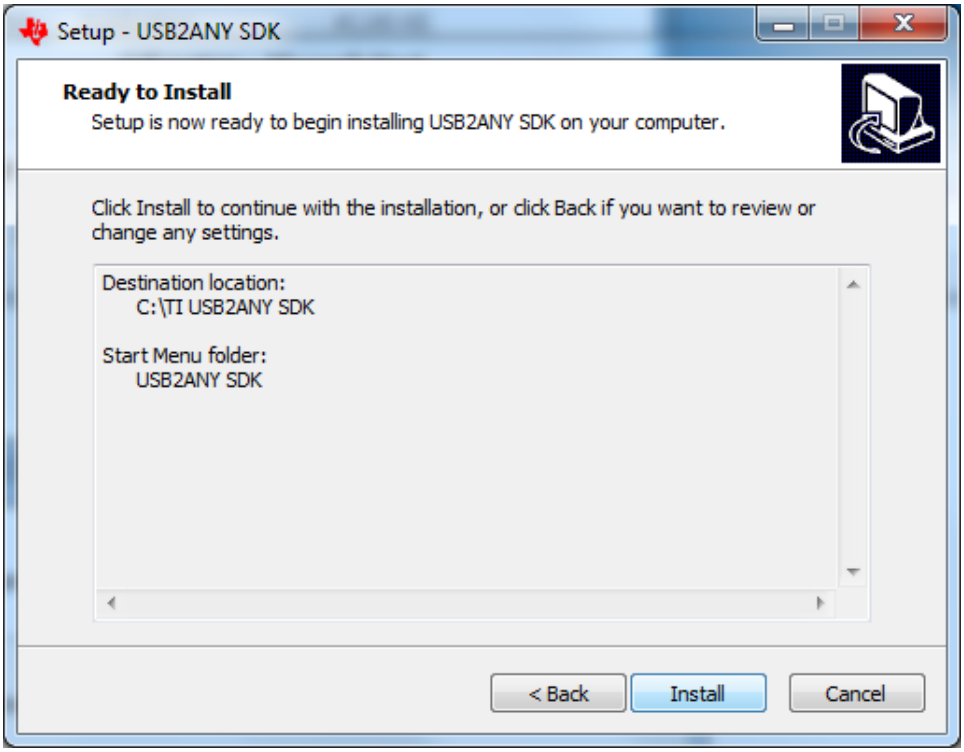



**Figure 26. USB2ANY Start Installation**

12. The installer begins self-extraction and proceeds with the installation.
13. When the USB2ANY installation is complete, the window show in Figure 27 is displayed, indicating the completion of the USB2ANY installation. Click the *Finish* button.


**Figure 27. USB2ANY Installation Complete**

**NOTE:** The DRV10983-Q1 GUI requires the LabVIEW Run-Time Engine 2010 to be installed before the GUI is executed.

The DRV10983-Q1 GUI installer does not include the LabVIEW Run-Time Engine. Go to http://www.ni.com/download/labview-run-time-engine-2014/4887/en/ to download the National Instruments LabVIEW Run-Time Engine.

## *A.3 GUI Overview*

The DRV10983-Q1 GUI was developed to communicate with the device to configure different registers within the device, and to understand the response based on the configurations. The following sections describe some of the specific features of the GUI, but do not explain the configurations of the controls and indicators.

Screen captures of the DRV10983 GUI are provided to explain the various features of the GUI. The same images apply to the DRV10975 devices unless otherwise specified.

### A.3.1 Components of the GUI

The device GUI contains three pages (or tabs):

- *Basic Settings*
- *Advanced Settings*
- *Display*

### A.3.1.1 Basic Settings

Figure 28 shows the *Basic Settings* tab of the GUI.

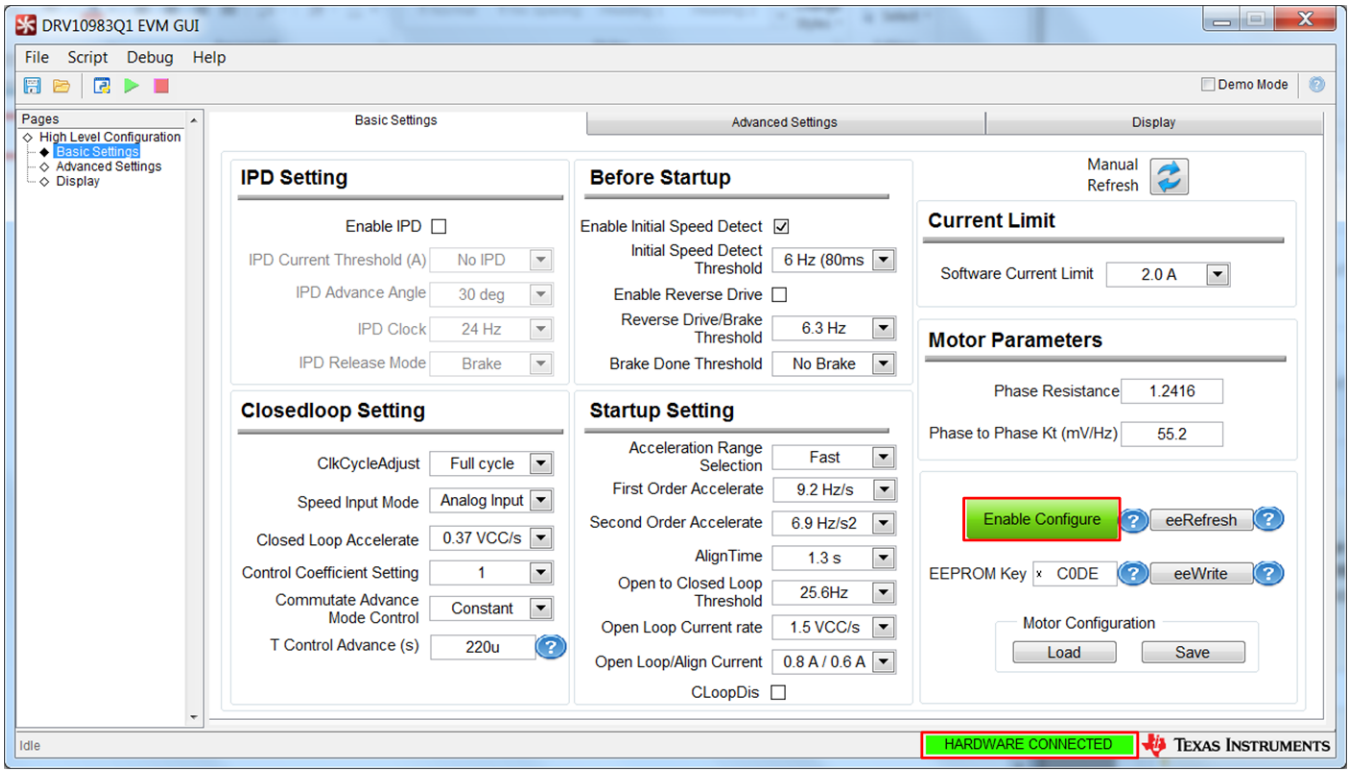



**Figure 28. Basic Settings Page**

#### A.3.1.1.1 Enable Configure

The controls in the *Basic Settings* tab and *Advanced Settings* tab are only enabled if the *Enable Configure* button is selected. This button specifies the data use between the registers and EEPROM. Click on the button to select the data use. If the *Enable Configure* button is enabled (the control turns green in color), the register data is used, or else (the control turns red) the EEPROM data is used.

#### A.3.1.1.2 Enable IPD

Clicking the *Enable IPD* checkbox enables and disables the controls related to IPD settings. If this control is disabled, a value 0 is written to the IPD current threshold. If the control is enabled, a value 1 is written to IPD current threshold field.

#### A.3.1.1.3 eeWrite

The *eeWrite* button programs to the EEPROM. When this control is clicked, a prompt message asks for confirmation of the voltage level (see Figure 29). The eeWrite field is written only if the *EEPROM Key* field is set to *C0DE*, and the power supply voltage level is confirmed.

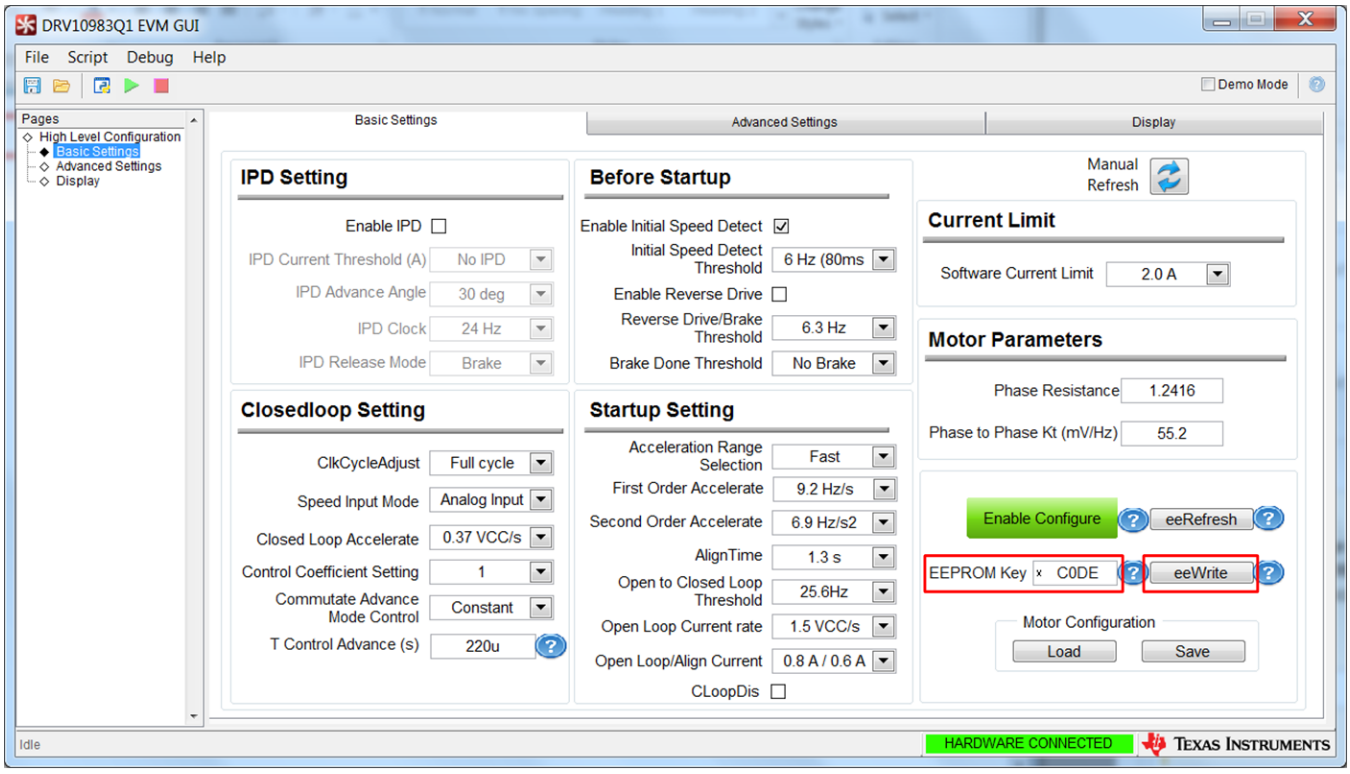



**Figure 29. Confirmation on Voltage Level**

#### *A.3.1.1.4 eeRefresh*

The *eeRefresh* button refreshes the controls in the *Basic Settings* tab, which reads the latest value of the corresponding fields from the registers and updates the controls.

#### *A.3.1.1.5 Manual Refresh*

The *Manual Refresh* button refreshes the controls in the *Motor Parameters* section, which reads the latest value of the corresponding fields from the registers and updates the controls. The function of this button is same in every section.

#### *A.3.1.1.6 Save Motor Configuration*

The *Save Motor Configuration* button saves the current motor configuration to a file that is later loaded into the GUI using the *Load* button. The button saves the last read values of the registers. Perform a manual refresh operation before saving the configurations into a file.

#### *A.3.1.1.7 Load Motor Configuration*

The *Load Motor Configuration* button loads the configuration file saved earlier, to bring the device to a known state.

#### *A.3.1.1.8 Help Icon*

Move the mouse over the blue help icon to display a brief description for the control, as shown in Figure 30.

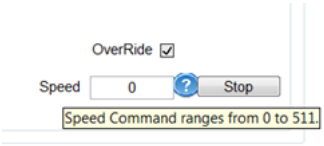



**Figure 30. Help Icon**

### *A.3.1.2 Advanced Settings*

The *Advanced Settings* tab contains controls to handle the frequency overflow, Current Limit for Lock Detection, FG motor pole option, and so forth (see Figure 31).

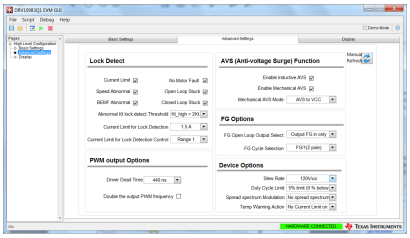



**Figure 31. Advanced Settings**

### A.3.1.3 Display

The *Display* tab (see Figure 32) contains controls to handle the motor speed, indicates the status of the device, and displays the value of motor attributes such as motor speed, current, and IPD position.

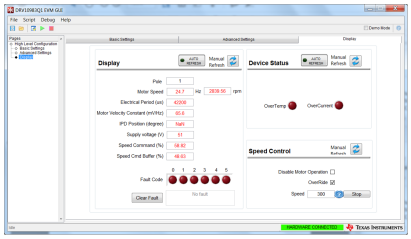


**Figure 32. Display**

#### A.3.1.3.1 Auto Refresh

The *Auto Refresh* button periodically refreshes the controls of the motor parameters, which read the latest value of the corresponding fields from the registers and update the controls. The rate of auto refresh is specified in the configuration file found parallel to the application. The function of this button is same in every section.

#### A.3.1.3.2 Pole

The number entered into the *Pole* text field is used to calculate the RPM in the *Display* section, given by the formula in Equation 1.

If motor speed (Hz) ≥ 2, motor speed (rpm) = (1 000 000 / electrical period [µs]) × 120/pole. Else, motor speed (rpm) = motor speed (Hz) × 120/pole.

The default value of this control is 1. (1)

#### A.3.1.3.3 Stop

The *Stop* button writes the speed control with a value of 0.

#### A.3.1.3.4 About

The *About* window provides the details like the GUI version, supported OS, and the firmware version of the USB2ANY.

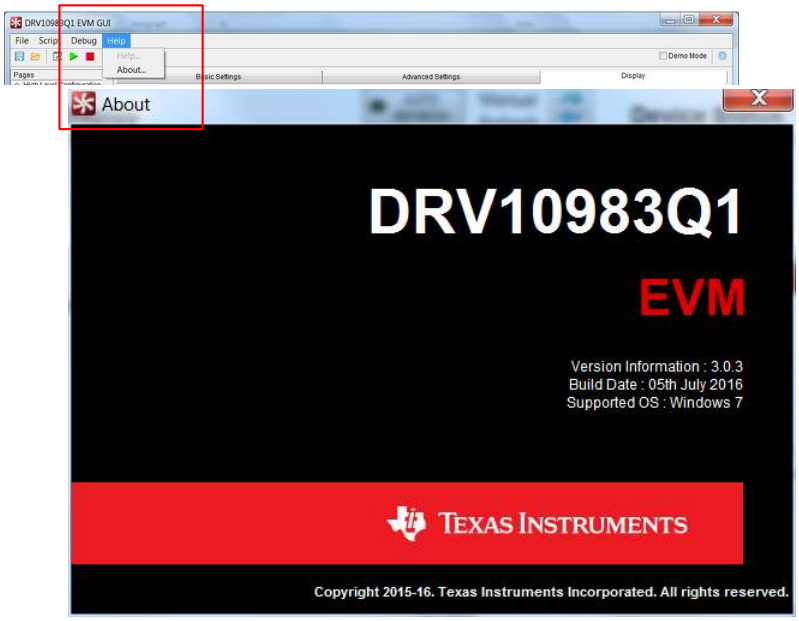



**Figure 33. About Page**

## A.3.2 Menu Options

### A.3.2.1 File

The *File* menu contains the *Exit* option as shown in Figure 34. The *Exit* option stops the execution of the DRV10983Q1 EVM GUI.

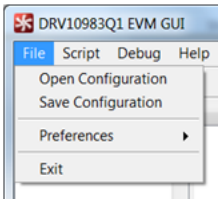



**Figure 34. File Menu**

### A.3.2.2 Script

Scripting automates the device operations and reduces the time consumption in repeating similar operations.

Scripting is helpful in situations where performing a particular device function requires setting 10 to 15 registers on the device to a particular value. In these circumstances, scripts can be recorded and run whenever needed.

In DRV10983Q1 EVM GUI, the scripting occurs using Python.

#### A.3.2.2.1 Recording and Running Scripts

Use the following steps to record and run the scripts:

Step 1. Go to the *Script* menu in the DRV10983Q1 EVM GUI and select the *Launch Script* option to start recording or click the *Launch Script Window* button as shown in Figure 35.

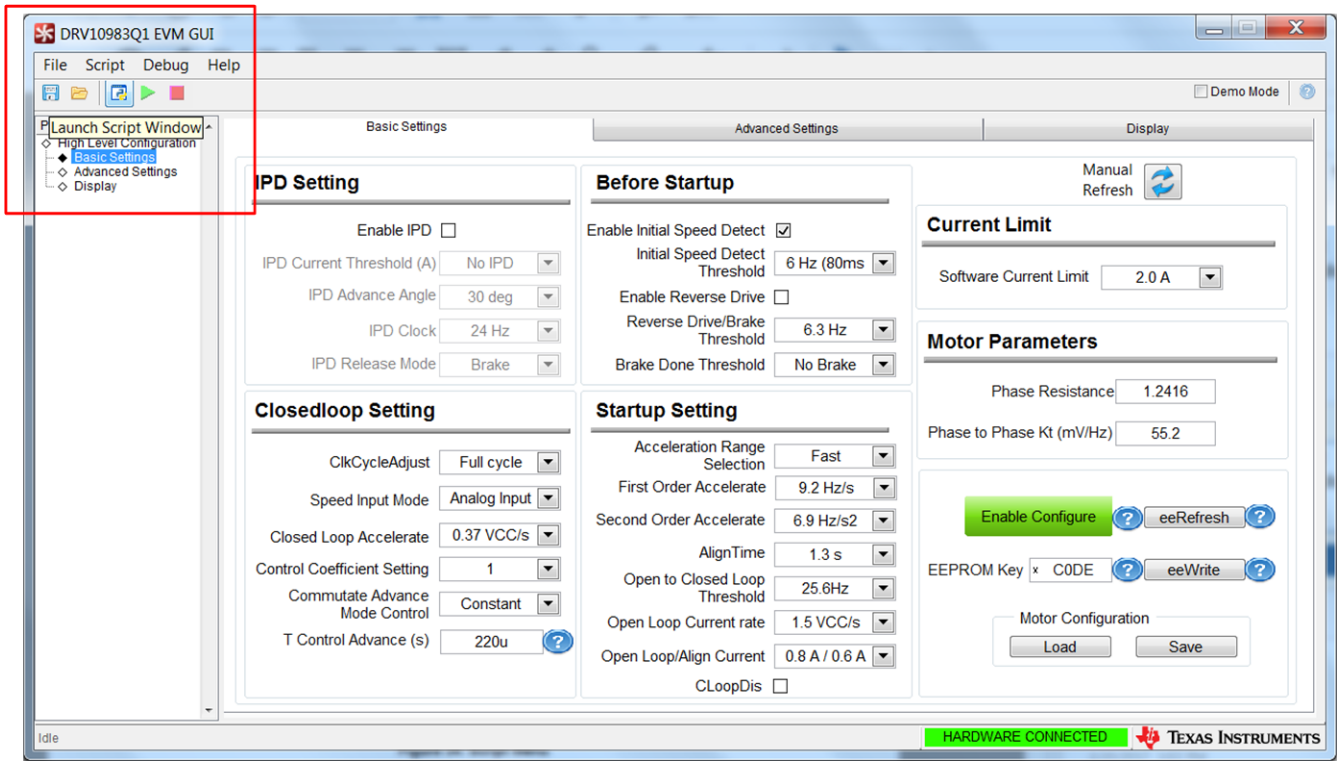



**Figure 35. Script Menu**

An untitled, empty Python window opens in the Idle IDE (see Figure 36).

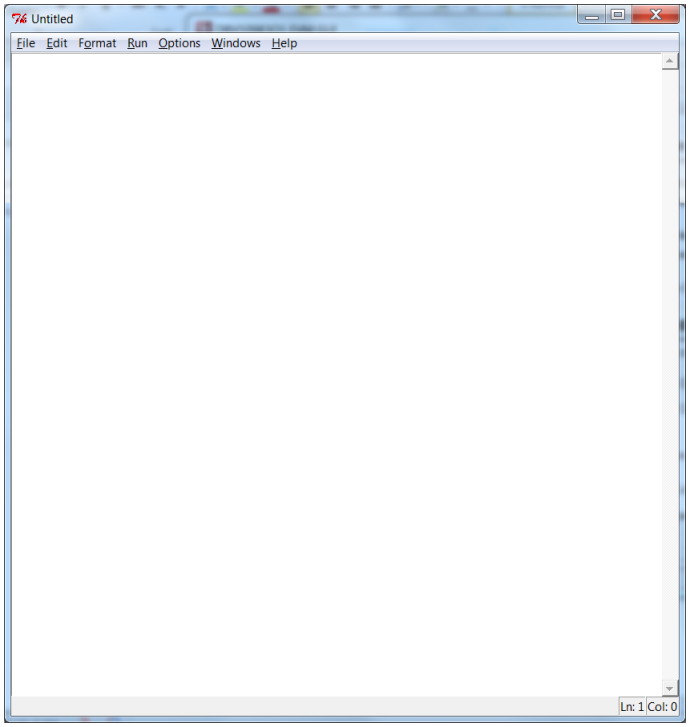



**Figure 36. Launch Macro**

When the Idle IDE Python window appears, the *Start Recording* option is enabled under the *Script* menu. The *Start Recording* button is also available as shown in Figure 37.

Step 2. Select the *Launch Script Window* option again to open another untitled window. The window that was last opened is the active window.

Step 3. In the GUI window, go to the *Scripts* menu and select the *Start Recording* option from the menu.

All actions performed on the GUI are recorded in the Idle IDE Python window. The recording function is indicated in the untitled Idle IDE Python window when the window flashes green, while the window is recording as shown in Figure 37.

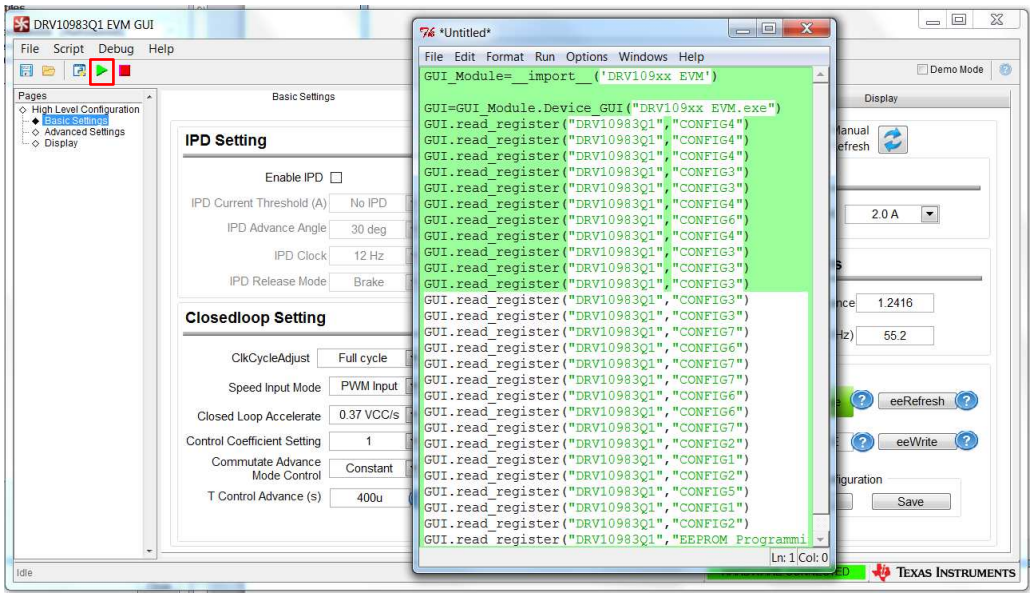



**Figure 37. Start Recording**

The Idle IDE Python window captures predefined actions only. While recording, no action, such as moving the cursor or entering data, has to be performed in the Idle IDE Python window. To stop recording, go to the *Script* menu in the DRV10983Q1 EVM GUI and select the *Stop Recording* option from the menu or click the *Stop Recording* button as shown in Figure 38.

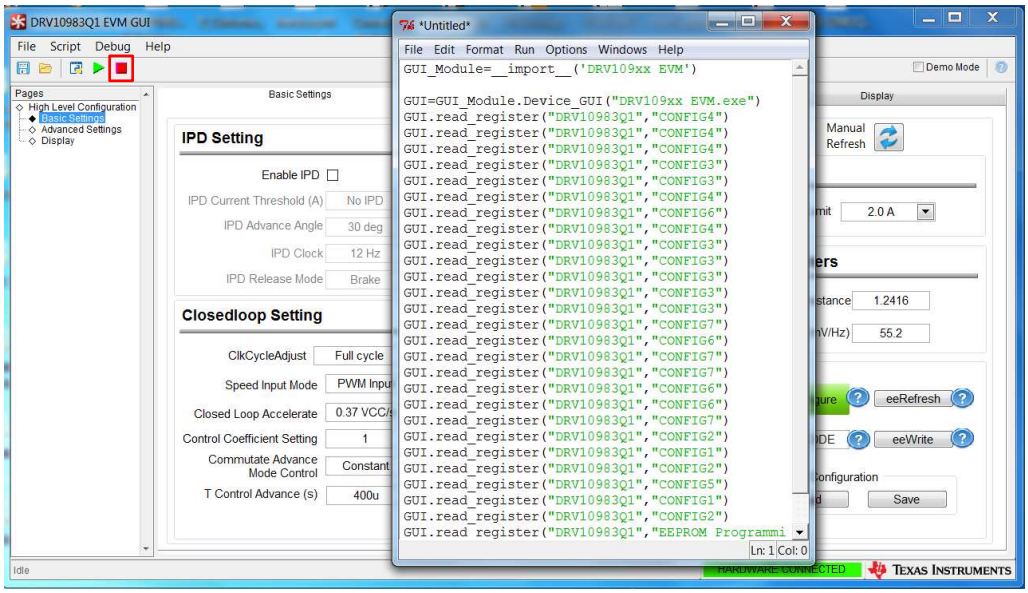



**Figure 38. Stop Recording**

The *Launch Script Window* remains open after the recording has been stopped as shown in Figure 38. This window can be closed with or without saving. To save the script, it must be saved with extension .py under the script folder.

To run the script, go to the *Run* menu and select the *Run Modeul* option in the untitled Idle IDE Python window as shown in Figure 39.

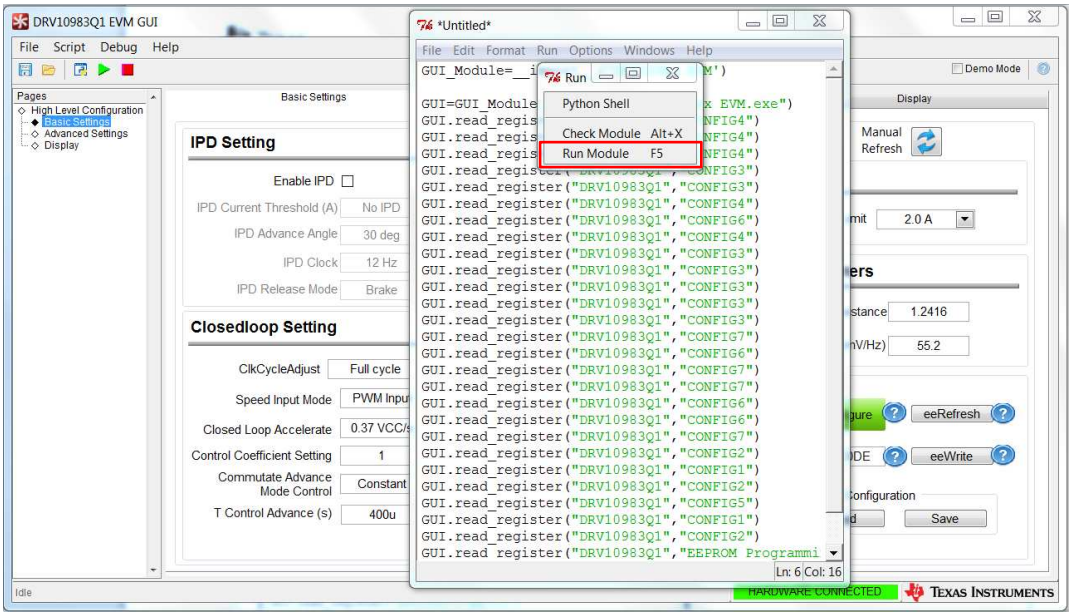



**Figure 39. Run Macro**

The script runs and displays the following message in the Idle IDE Python window: *Script completed successfully*.

To run a saved script, go to the *File* menu and select the *Open* option in the Idle IDE Python window. Select the file from the *Scripts* folder.

#### *A.3.2.2.2 Debug*

The debug option is used for the following operations:

**Simulation —** Selecting the *Demo* menu option runs the GUI in demo mode. Unselecting *Demo* mode runes the GUI in connected mode.

**Debugging —** The *Debug Log* menu option logs all user activities. If not selected, only the high-level operations are logged.

**File logging —** The *Log to File* menu option logs the GUI activities to a specified log file.

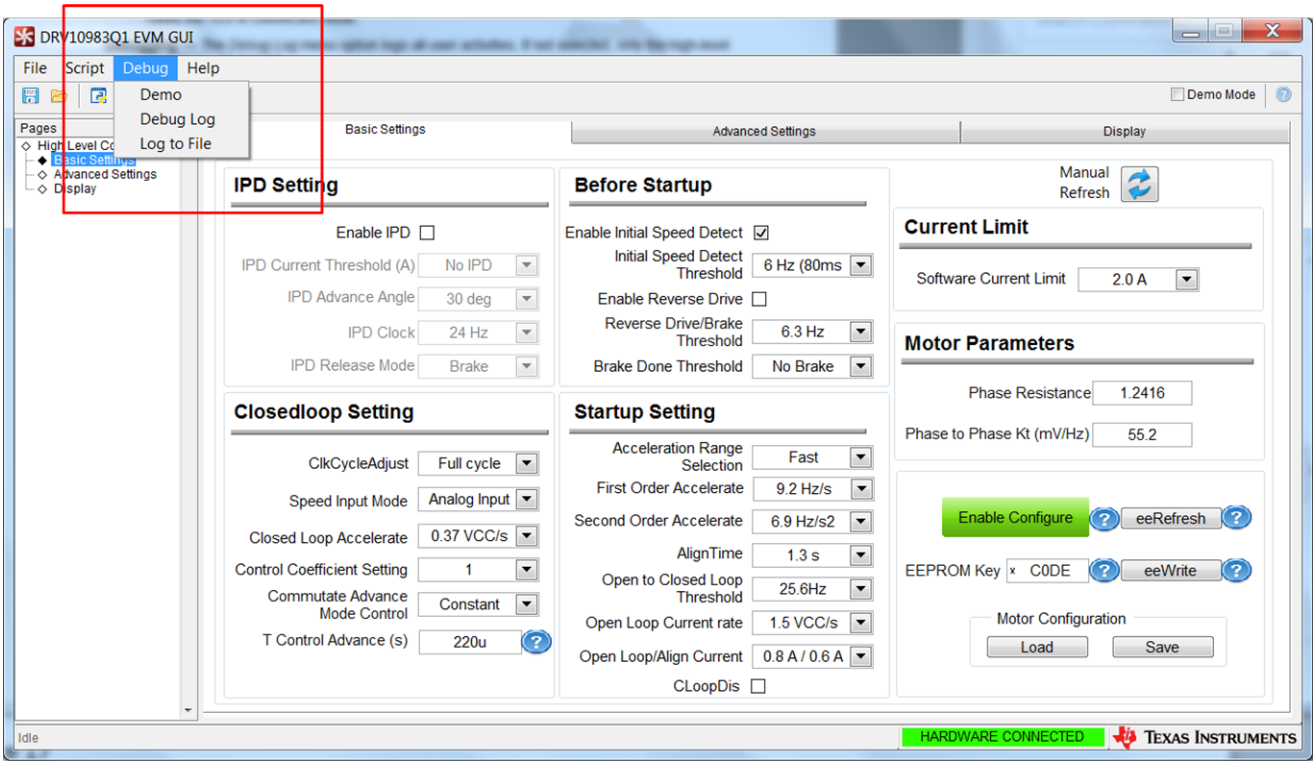



**Figure 40. Debug Menu**

# GUI to DRV10983-Q1 Register Cross Reference

The DRV10983-Q1 register names and GUI names do not always match. Table 7 provides a cross reference between the different names. The tab and section location of the register values in the GUI is also provided.

**Table 7. GUI to DRV10983-Q1 Register Cross Reference**

| Registers | | | GUI | | |
|---|---|---|---|---|---|
| **Register Name** | **Address** | **Register Map** | **Tab** | **Section** | **GUI Name** |
| CONFIG1 | 0x90 | SSMConfig[1:0] | Advance | Device Options | Spread spectrum Modulation |
| | | FGOLSel[1:0] | Advance | FG Options | FG Open Loop Output Select |
| | | FGCycle[3:0] | Advance | FG Options | FG Cycle Selection |
| | | ClkCycleAdjust | Basic | Closedloop Setting | ClkCycleAdjust |
| | | RMShift[2:0] RMValue[3:0] | Basic | Motor Parameters | Phase Resistance |
| CONFIG2 | 0x91 | KtShift[2:0]KtValue[3:0] | Basic | Motor Parameters | Phase to Phase Kt (mV/Hz) |
| | | CommAdvMode | Basic | Closedloop Setting | Commutate Advanced Mode Control |
| | | TCtrlAdvShift[2:0]TCtrlAdvValue[3:0] | Basic | Closedloop setting | T Control Advanced (s) |
| CONFIG3 | 0x92 | ISDThr[1:0] | Basic | Before Startup | Initial Speed Detect Threshold |
| | | ISDEn | Basic | Before Startup | Enable Initial Speed Detect |
| | | RvsDrEn | Basic | Before Startup | Enable Reserve Drive |
| | | RvsDrThr[1:0] | Basic | Before Startup | Reserve Drive/Brake Threshold |
| | | OpenLCurr[1:0] | Basic | Startup Setting | Open Loop / Align Current |
| | | OpLCurrRt[2:0] | Basic | Startup Setting | Open Loop Current rate |
| | | BrkDoneThr[2:0] | Basic | Before Startup | Break Done Threshold |
| CONFIG4 | 0x93 | AccelRangeSel | Basic | Startup Setting | Acceleration Range Selection |
| | | StAccel2[2:0] | Basic | Startup Setting | Second Order Accelerate |
| | | StAccel[2:0] | Basic | Startup Setting | First Order Accelerate |
| | | Op2ClsThr[4:0] | Basic | Startup Setting | Open to Closed Loop Threshold |
| | | AlignTime[2:0] | Basic | Startup Setting | Align Time |
| CONFIG5 | 0x94 | OTWarning_ILimit[1:0] | Advanced | Device Options | Temp Warning Action |
| | | LockEn5 | Advanced | Lock Detect | Closed Loop Stuck |
| | | LockEn4 | Advanced | Lock Detect | Open Loop Stuck |
| | | LockEn3 | Advanced | Lock Detect | No Motor Fault |
| | | LockEn2 | Advanced | Lock Detect | BEMF Abnormal |
| | | LockEn1 | Advanced | Lock Detect | Speed Abnormal |
| | | LockEn0 | Advanced | Lock Detect | Current Limit |
| | | SwILimit[3:0] | Basic | Current ILimit | Software Current Limit |
| | | HwILimit[2:0] | Advanced | Lock Detect | Current Limit for Lock Detection |
| | | IPDasHwILimit | Advanced | Lock Detect | Current Limit for Lock Detection Control |

**Table 7. GUI to DRV10983-Q1 Register Cross Reference (continued)**

| Registers | | | GUI | | |
|---|---|---|---|---|---|
| Register Name | Address | Register Map | Tab | Section | GUI Name |
| CONFIG6 | 0x95 | SpdCtlrMd | Basic | Closedloop Setting | Speed Input Mode |
| | | PWMFreq | Advanced | PWM output Options | Double the output PWM frequency |
| | | KtLckThr[1:0] | Advanced | Lock Detect | Abnormal Kt lock detect Threshold |
| | | AvSIndEn | Advanced | AVS (Anti-voltage Surge) Function | Enable Inductive AVS |
| | | AVSMEn | Advanced | AVS (Anti-voltage Surge) Function | Enable Mechanical AVS |
| | | AVSMMd | Advanced | AVS (Anti-voltage Surge) Function | Mechanical AVS Mode |
| | | IPDRIsMd | Basic | IPD Setting | IPD Release Mode |
| | | CLoopDis | Basic | Startup Setting | CLoopDis |
| | | ClsLpAccel[2:0] | Basic | Closedloop Setting | Closed loop Accelerate |
| | | DutyCycleLimit[1:0] | Advanced | Device Options | Duty Cycle Limit |
| | | SlewRate[1:0] | Advanced | Device Options | Slew Rate |
| CONFIG7 | 0x96 | IPDAdvcAg[1:0] | Basic | IPD Setting | IPD Advanced Angle |
| | | IPDCurrThr[3:0] | Basic | IPD Setting | IPD Current Threshold (A) |
| | | IPDClk[1:0] | Basic | IPD Setting | IPD Clock |
| | | CtrlCoef[1:0] | Basic | Closedloop Setting | Control Coefficient Setting |
| | | DeadTime[4:0] | Advanced | PWM output Options | Driver Dead Time |
| EEPROM Programming5 | 0x35 | ShadowRegEn | Basic | | Enable Configure |
| | | eeWRnEn | Basic | | eeWrite |
| | | eeRefresh | Basic | | eeRefresh |
| EEPROM Programming1 | 0x31 | ENPROGKEY[15:0] | Basic | | EEPROM Key |
| SpeedCtrl | 0x30 | OverRide | Display | Speed Control | OverRide |
| | | SpeedCtrl[8:0] | Display | Speed Control | Speed |
| MTD_TEST1 | 0x60 | SCORE_DIS | Display | Speed Control | Disable Motor Operation |

## Revision History

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

**Changes from Original (June 2017) to A Revision** **Page**

- Changed *R14* to *R2* globally throughout the user's guide. ..... 1
- Changed the *L1* designator description, manufacturer, and part number in the BOM. ..... 17
- Changed the *R3*, *R4*, *R5* designator in the BOM from *R5*, *R6*, *R7*. ..... 17
- Changed the *R2* designator in the BOM from *R14*. ..... 17
- Changed the *R1* designator in the BOM from *R15*. ..... 17

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

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.

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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。
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西新宿三井ビル

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

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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.

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.

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