DRV89xx-Q1EVM User's Guide

This document is provided with the DRV8912-Q1EVM and DRV8908-Q1EVM customer evaluation modules (EVMs) as a supplement to the *DRV89xx-Q1 Automotive Multi-Channel H-Bridge Motor Driver* data sheet. This user's guide details the hardware implementation of the EVM and how to install the software packages.

Contents

List of Figures

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1 Introduction

1.1 Overview

The DRV8912-Q1 and DRV8908-Q1 devices are integrated 4.5-V to 20-V/32-V multi-channel integrated half-bridge motor drivers which support a maximum voltage of 40-V for load-dump scenario. The DRV8912-Q1 device has 12 outputs, while the DRV8908-Q1 has 8 outputs and it also includes passive open load detection. The devices are designed to support 1-A per independent half-bridge (limited by the thermal dissipation of package) and can drive the motors in independent, sequential, or parallel mode. Also, the motor is fully controllable with forward, reverse, coasting and braking mode support. A standard 16-bit serial peripheral interface (SPI) provides a simple method for configuring the various device settings and reading fault diagnostic information through an external controller.

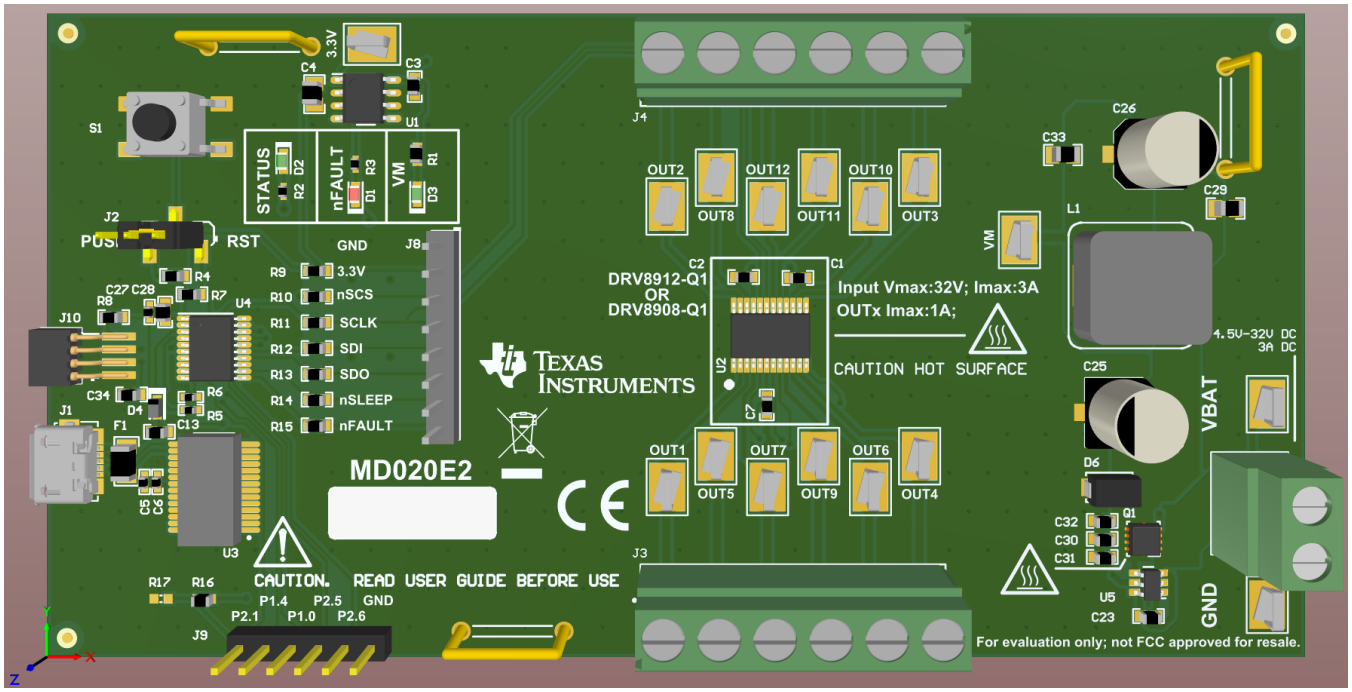

Figure 1. DRV8912-Q1EVM shown (Actual Board May differ)

The configuration, operation and diagnostics of the device is controlled by a 16-bit SPI with daisy chain compatibility. Internal PWM generators are also supported on this device, which allows current limiting during motor operation and can be used for the dimming control of LEDs. The device has four PWM generators which are programmable for four different PWM frequency and individual 8-bit duty control. Any half-bridge can be mapped to any internal PWM generator for realizing a parallel operation.

The device has numerous protection and diagnostic features. The open load detection feature allows for easy monitoring of the load connected to the half-bridge. The device is fully-protected from short-circuit conditions (short to OUTx, short to supply and short to ground) with OCP protection. Moreover, OTW and OTSD ensures the device thermal protection in scenario's of over-heating.

1.2 Purpose and Scope

This document is designed to be used as a startup guide and to supplement the DRV8912-Q1EVM and the DRV8908-Q1EVM. This document is intended for the engineers involved in the design, implementation, and validation of DRV89xx-Q1 devices. The scope of this document is to provide the user with a guide to evaluate the DRV89xx devices using GUI control. This document covers the hardware (HW) connections required between the DRV8912-Q1EVM and DRV8908-Q1EVM to the GUI. When the HW connections are complete, the user is required to download and open the GUI to control the connected EVM's DRV89xx-Q1 device.

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2 Hardware and Software Overview

WARNING

Hot surfaces on the DRV89xx-Q1EVMs include the DRV89xx-Q1 devices (U2) and the area surrounding it.

DRV89xx-Q1EVMs is rated for power supply voltages between 4.5 VDC and 32 VDC max. It can support 1.0-A RMS Current Per Half-Bridge and total 3 A maximum current for All Outputs. Component temperatures are below the 125°C rating of the printed circuit board materia with the continuous current of all outputs be limited to total 3 A when operating for extended periods of time at an ambient temperature of 25°C. The nFAULT pin indicates when the device temperature has increased above 175°C and is approaching thermal shutdown. As with any elevated temperatures, normal precautions must be followed to avoid direct contact with the hot surface of the DRV89xx-Q1EVMs.

To minimize potential fire hazard, personal injury, or both, externally provided fans may be required to adequately cool customer-provided loads depending on loading conditions.

2.1 Hardware Connections Overview

The major blocks of the DRV89xx-Q1EVMs include the DRV89xx-Q1EVM, the MSP430G2553 microcontroller (MCU), the LM9036QMX-3.3/NOPB 3.3-V LDO regulator, and the USB communication. The DRV89xx-Q1EVMs are designed for an input supply from 4.5 to 32 V and 1.0-A RMS Current Per Half-Bridge and total 3 A maximum current for All Outputs.

The DRV89xx-Q1 device is used to provide the current to the motor or other load. The MCU communicates with the GUI to control the DRV89xx-Q1 device.

2.2 Connection Details

Figure 1 shows the power connector J7 and motor phase connectors and J3 and J4. A supply voltage ranging from 4.5 V to 32 V from a battery or a DC voltage source is connected to the voltage supply pins. Each OUTx pins can be connected to a single motor winding, inductor, or latched relay coil when used in independent half-bridge mode.

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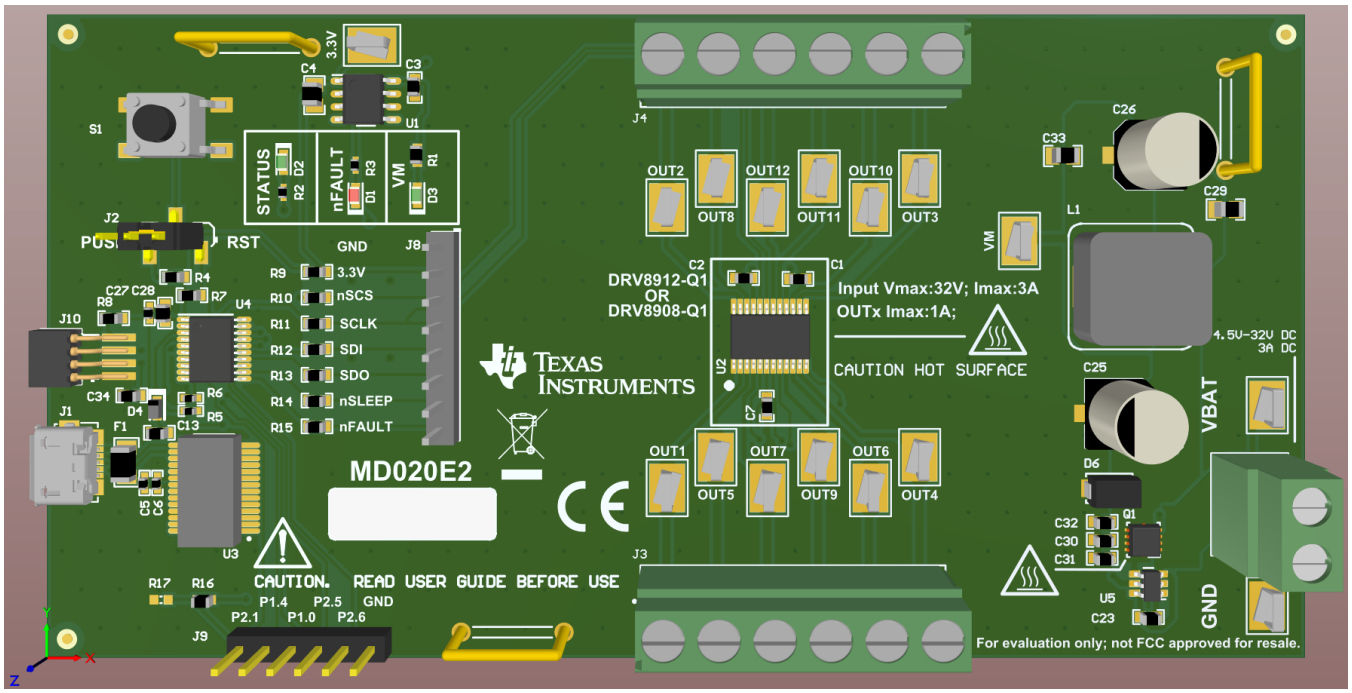

Figure 2. EVM Connections (Actual Board May Differ)

2.3 LED Lights and Switch Functions

Three LED switches and one push-button switch are available on the DRV89xx-Q1EVMs to notify the user of different motor statuses and to control the operation of the motor. The STATUS LED will blink at a regular interval to provide an indication the MSP430G2553 MCU is powered and code is running. The nFAULT LED will light when the DRV89xx device detects an abnormal condition, such as overcurrent, overtemperature, or open load. The VM LED will light when a input source is connected.

The S1 switch is configured to reset the MSP430G2553 MCU. By moving the J2 jumper to the alternate position, the switch can be used as a general-purpose input if user-supplied code is installed.

3 GUI Application

The GUI is used to control the DRV89xx-Q1EVMs through USB commands. The commands are sent from the computer to the FTDI FT233RL device, which converts USB commands to UART commands. The UART commands are received by the MSP430G2553 MCU.

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3.1 Installation

Follow these steps to install the GUI application:

Step 1. Double click on the *Setup_DRV89xx-Q1EVM-y.y.y.exe* file. The y.y.y values shown may change as the GUI is updated.Reason Request

Step 2. Click the *Next* button in the *Setup - DRV89xx-Q1* window (see Figure 3).

Figure 3. Setup DRV89xx-Q1 Window

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Step 3. Review the license agreement (see Figure 4).

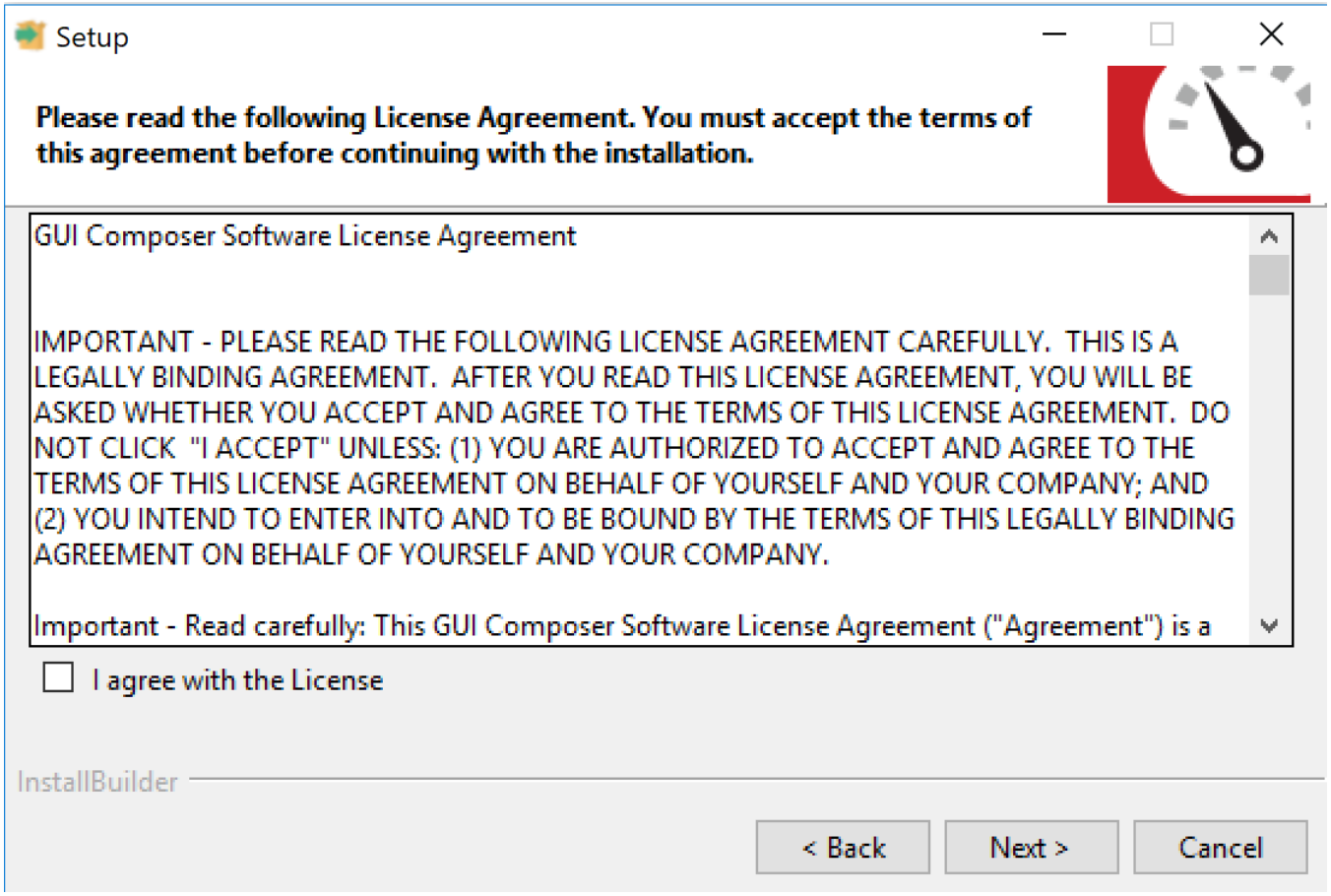

Figure 4. License Agreement

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Step 4. Check the *I agree with the license* option if accepted and then click the *Next* button (see Figure 5).

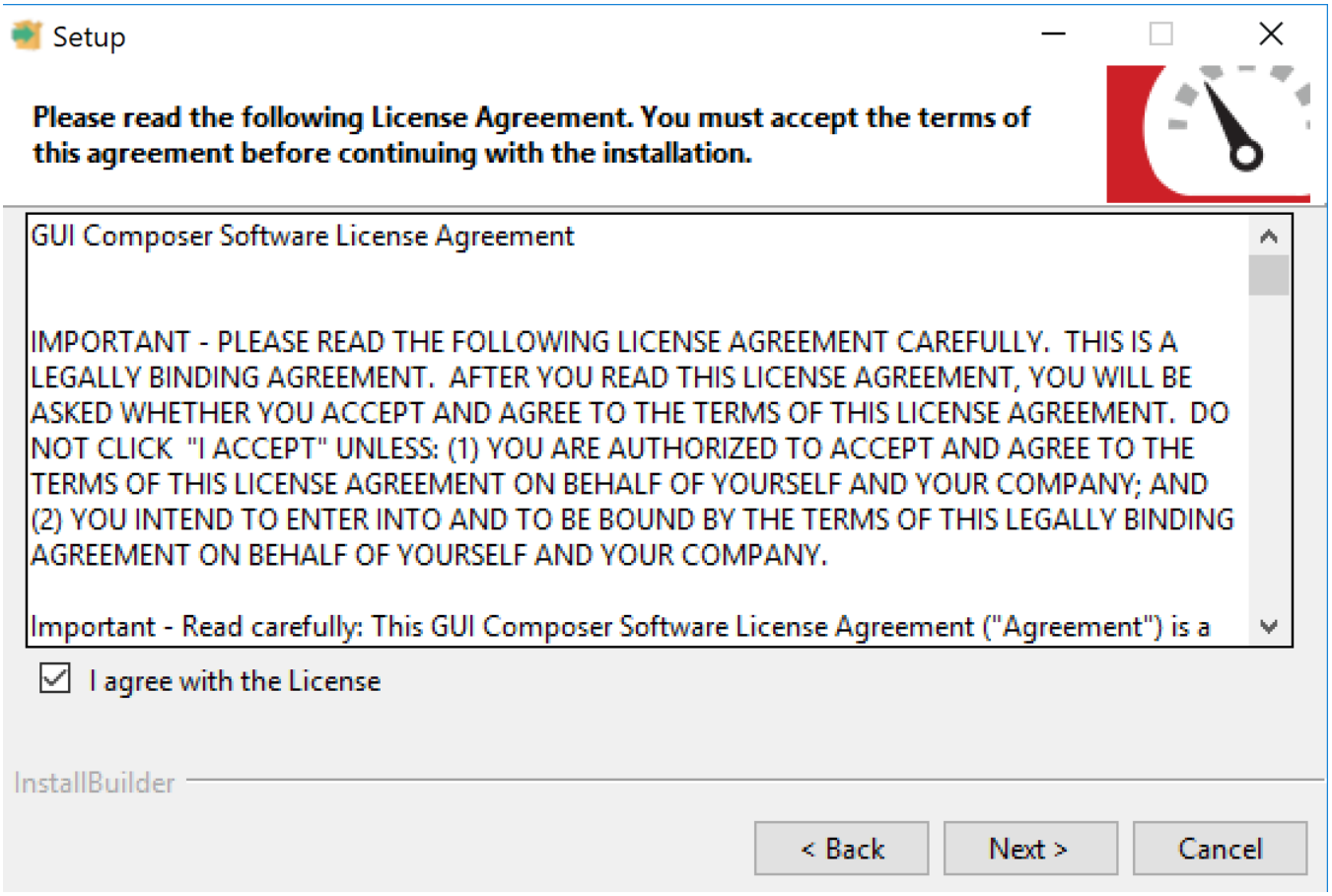

Figure 5. Accepted License Agreement

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Step 5. Select the installation directory. TI recommends using the default installation directory. Click the *Next* button when the directory is determined (see Figure 6).

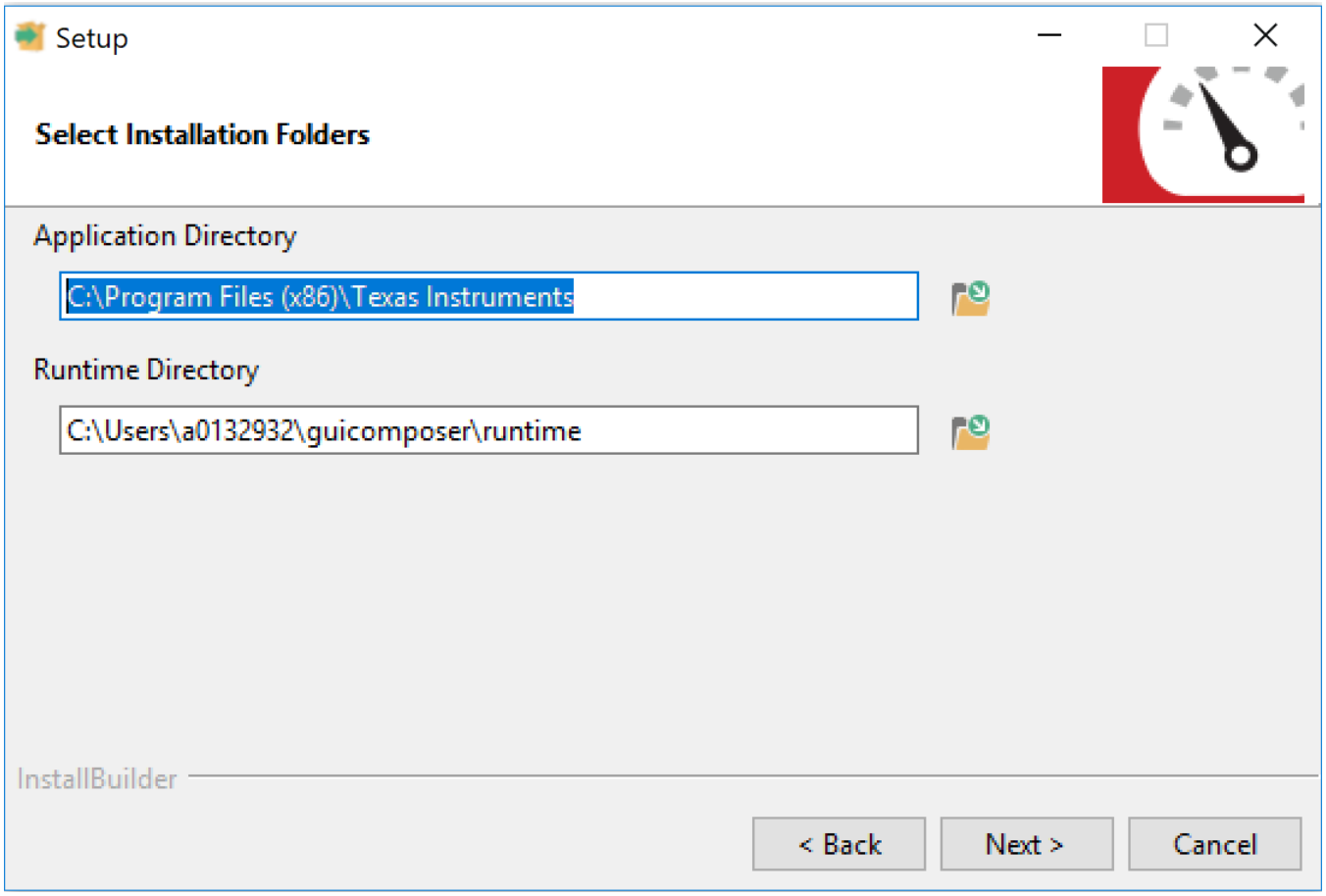

Figure 6. Installation Directory

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Step 6. If you don't install GUI Composer Runtime before, please install it from website or your local hard disk (see Figure 7). Runtime v7.0.0 can be downloaded from https://dev.ti.com/gallery/info/MotorDriversBSM/DRV89xx-Q1. We recommend running latest version available. You may be asked to add an extension to your browser and install TI Cloud Agent. After GUI composer runtime and DRV89xx-Q1 GUI are installed, you will go step 9 and check Figure 8.

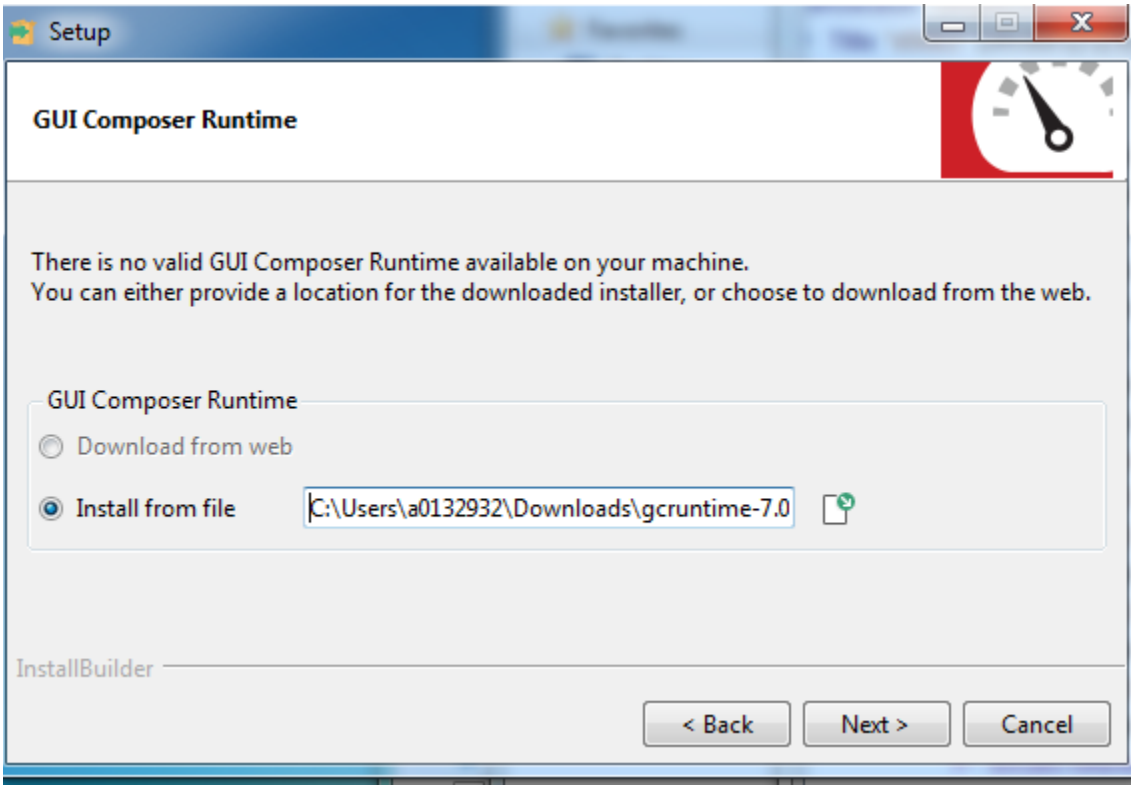

Figure 7. GUI Composer Runtime

Step 7. If you have installed "DRV89xx-Q1EVM GUI" before, please confirm you want to install this current GUI or not. Click the *Yes* button will go *Ready to Install* window.

Step 8. Click the *Next* button in the *Ready to Install* window to begin the installation.

When the installation begins, the *Installing* window shows the installation progress.

The installation is now complete.

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Step 9. After config "Start Menu" and "Desktop" shortcut setting, Click the *Finish* button to close the installer and begin using the GUI (see Figure 8).

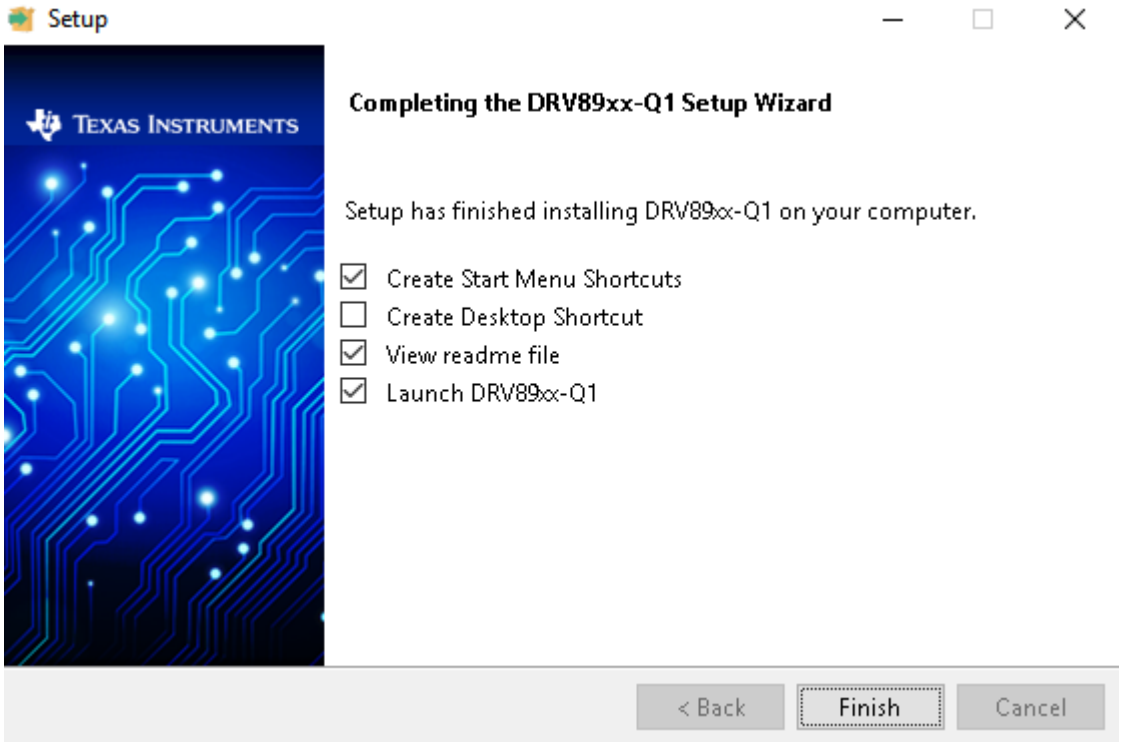

Figure 8. Installation Complete

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4 GUI Operation

The DRV89xx-Q1EVM GUI along with DRV89xx-Q1EVM facilitate control of brushed DC motors; LED or resistor load. The DRV89xx-Q1EVM GUI 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 current, and monitoring the device fault status. The GUI can also be used to test the motor for best performance using various parameters available in the *Motor Control* page.

4.1 Hardware Setup

The hardware required to run the DRV89xx-Q1EVM is a micro-USB cable and a power supply from 4.5 to 32 V. Follow these steps to start up the DRV89xx-Q1EVM:

Step 1. Connect the positive output of the DC power supply to the VM screw terminal and the negative output to the GND screw terminal.

Step 2. Use the OUTx screw terminals to connect to the desired loads.

Step 3. Turn on the power supply and power up the printed circuit board (PCB).

Step 4. Connect a micro-USB cable to the DRV89xx-Q1EVM and computer.

NOTE: Steps 3 and 4 need to be followed in that order or the GUI connection will show a popup indicating a repower of EVM and reconnection of USB, in that order.

4.2 Launching the DRV89xx-Q1EVM GUI

To launch the GUI, click on the DRV89xx-Q1EVM shortcut on the desktop or navigate to the Windows Start Menu and click *All Programs*. Navigate to the Texas Instruments folder and select the DRV89xx-Q1EVM icon. If GUI "Menu" page shows "Device Disconnected", please make sure the internal net connection and USB cable connection. And then, click the button left "<>" button to restart the connection.

For a guide on the different attributes of the DRV89xx-Q1EVM GUI, refer to the *DRV89xx-Q1EVM GUI User's Guide*. Figure 9 shows an example of the GUI.

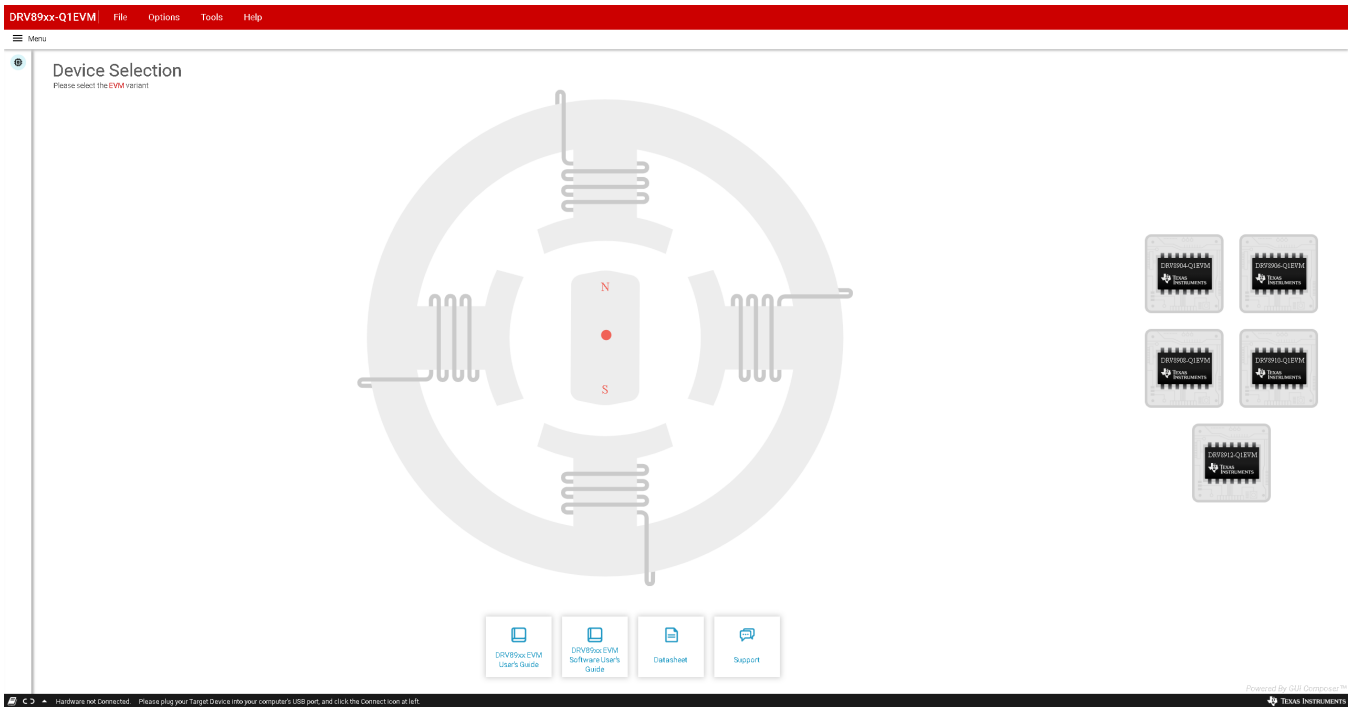

Figure 9. Example of DRV89xx-Q1EVM GUI Open

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