

# DRV8343x-Q1EVM GUI User's Guide

This document is provided with the DRV8343H-Q1EVM and DRV8343S-Q1EVM (DRV8343x-Q1EVM) customer evaluation modules (EVMs) as a supplement to the *DRV8343-Q1 Automotive 5.5 to 60-V Three-Phase Smart Gate Driver With Three Integrated Current-Shunt Amplifiers* data sheet. This user's guide details how to use the DRV8343x-Q1EVM 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 DRV8343x-Q1EVM:

- DRV8343x-Q1EVM
- Three-phase BLDC motor, single-phase brushed motors, or solenoid loads
- Voltage supply from 6 V to 60 V
- Jumper wires (for connections)
- DRV8343x-Q1EVM reference software development package
- Code Composer Studio<sup>™</sup> software V.6.0 and above

For additional details on hardware connections refer to the *DRV8343H-Q1EVM and DRV8343S-Q1EVM User's Guide*.

This document only describes the installation and usage of the DRV8343x-Q1EVM GUI.

## 2 GUI Application

## 2.1 Installation

Follow these steps to install the DRV8343x-Q1EVM application:

Step 1. Install the GUI.

Download and run the installer file, *DRV8343-Q1x-0.1.0\_EVM\_GUI.exe*, to install the GUI application.

Step 2. Download the latest FTDI drivers from http://www.ftdichip.com/Drivers/VCP.htm to enable the USB communication from the GUI to the DRV8343x-Q1 EVM board. From the FTDI webpage, obtain the latest VCP windows driver executable.

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MCU										
Sales Network	This software is provided by F	uture Technology	Devices Interna	tional Limited	as is" and	any express	or implied w	arranties, in	cluding, but	not limited to, the implied warranties of merchantability and fitness for a particular
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Newsletter	substitute goods or services; li	nss of use, data, r	or profits; or bus	iness interruptio	n) howeve	r caused and	on any theo	ry of liability	, whether in	contract, strict liability, or fort (including negligence or otherwise) ansing in any way
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Figure 1. FTDI Driver Installation

## 2.2 Using DRV8343x-Q1EVM GUI

The DRV8343x-Q1EVM GUI along with DRV8343x-Q1EVM facilitates control of a three-phase brushless DC motor, multiple single-phase motors, or a combination of loads depending on the hardware setting of the EVM board and the corresponding firmware uploaded to the microcontroller unit (MCU) of the DRV8343x-Q1EVM.

For each configuration of the DRV8343x-Q1EVM the loads are controlled using various widgets and settings. For example, the DRV8343x-Q1EVM GUI provides functionality for adjusting the speed and direction of the motor, adjusting various parameters such as voltage and current protection, monitoring the device fault status, and running diagnostics through the open-load detection architecture.

To learn more about the different modes of operation of the DRV8343x-Q1EVM along with the DRV8343x-Q1EVM GUI refer to the following documents:



- Texas Instruments, DRV8343x-Q1 Sensored Software User's Guide
- Texas Instruments, DRV8343x-Q1 Sensoreless Software User's Guide
- Texas Instruments, DRV8343x-Q1 Independent Mode Software User's Guide

Use the steps that follow to get started with the GUI:

- Step 1. Attach the motor to the output connectors of the DRV8343x-Q1EVM.
- Step 2. Plug in the micro-USB cable to the PC.
- Step 3. Enable the motor power supply. For more information on hardware connections refer to the DRV8343H-Q1EVM and DRV8343S-Q1EVM User's Guide.
- Step 4. Click on DRV8343x-Q1EVM GUI shortcut either on the desktop or from the start menu to run the GUI application.





Figure 2. DRV8343x-Q1EVM GUI (Launch Page)

- Step 6. Make sure to launch the correct device that matches the target device.
- Step 7. The first matching device (device supported by the application for the selected device variant) that gets connected to the PC will be auto connected. If multiple devices are connected, go to the Serial Port page to manually select an available COM port.
- Step 8. When the GUI connects successfully, the status shown in Figure 3 is displayed. The bottomleft corner of the status bar displays a green indicator to indicate the connection is successful.



Figure 3. DRV8343x EVM GUI (Correct Connection)



**GUI** Application

If the launched device does not match the target device on the DRV8343xQ1EVM, the serial port page will show the COM port disconnected as shown in Figure 4.

DRV	8343-Q1 File Tools Help			- / ×
=	Menu			
*	Serial Port Page			
/ 0 -0 E		COM1 Communications Port Manufacturer : (Standard port types) pnpld : ACPI/PNP0501\0		
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E				
×				
•				
	Not connected			🔱 Texas Instruments

### Figure 4. DRV8343x-Q1EVM GUI (Serial Port Page Showing the Required Friendly Name)

If nothing is physically connected to the PC, -- *No Device Connected* -- will be displayed.Step 9. Click on the menu button on the top-left corner of the GUI to open the side-bar menu.Step 10. Use the side-bar menu to navigate to the following pages or sub-pages at any time. The pages that follow are in context to the launched device:

- Introduction
- Registers
- Sensored
- Sensorless
- Independent Mode
- Current Sense (Only for S variant)
- Smart Gate Drive (Only for S variant)
- Serial Port
- Back

When the microcontroller is flashed with one of three provided firmware, only the options corresponded to that particular firmware appear in the menu.

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GUI Application

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### Figure 5. DRV8343x-Q1EVM GUI (Menu)

Step 11. Introduction page

Click the home icon to go to the Introduction page.

DRV8343S - Q1 EVM     Automotive 60-V Three Phase Smart Gate     Orier More Infa	EVM Setup Vic
Features	What would you like to drive ?
Current Sense >	Sensorfiess Motor
Register Map >	Independently Drive upto 6 Leads.

## Figure 6. DRV8343x-Q1EVM GUI (Introduction Page)

The Introduction page has the general information about the DRV8343x-Q1EVM device and links for their collaterals.



#### Step 12. Registers page

The Registers page shows all the registers and their fields present on the DRV8343-Q1 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

Figure 7. DRV8343x-Q1EVM GUI (Registers Page)

Step 13. Motor Control pages

Three pages for motor control are available. The appropriate page is automatically selected based on whether the reference firmware on the DRV8343x-Q1EVM is sensored, sensorless, or independent mode algorithm. The pages have different widget controls for controlling and tuning the motor and setting parameters.

Hall Sensored Page (Motor Control and Tuning)

This page has different widget controls to control the motor and tune the parameters using the Hallsensored algorithm as shown in Figure 8.

- Click on the DRV8343x-Q1EVM Sensored Software User's Guide document link on the top of this page to understand Hall 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 in the GUI to understand operation and range of input values of that particular widget.

Follow these steps to run the motor with the Hall sensored algorithm:

- 1. Follow the steps in Section 2.1 and the DRV8343x-Q1EVM user's guide to correctly install the sensored project to the microcontroller.
- 2. When the GUI is on the Sensored Control page, enable the driver by following these steps:
  - 1. Click on the ENABLE DRIVER 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.

3. 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 or equal to the *Minimum Duty Cycle* value.

4. Start the motor.

Click on the START MOTOR button to turn it green.

5. Use the widgets under Sensored Tuning to tune the motor.

When the value of a particular parameter is changed from GUI (by editing the value in any widget by sliding the slider or other editing means), the corresponding change is written to the firmware running on the microcontroller.

- 6. Monitor the right side panel *MOTOR STATUS and FAULT STATUS* to monitor the electrical speed, current motor speed, and any faults present.
  - If any fault is present, the motor stops spinning and the corresponding fault is reported under the *FAULT STATUS* section.
  - Perform the required actions to come out of the fault. For example, change the motor parameter values related to the fault.
  - For most cases, monitoring the *Phase Faults* diagram locates the actual error.
- 7. To run the open load diagnostics, click the Run OLP Test button.
- 8. Click the Run Diagnostics button to update the status in the Phase Faults diagram.
- 9. Click the *Clear Fault* button to make the firmware try clearing a fault.

DRV83	43-Q1 File Tools Help									- × ×
≡ M	enu									
*	Sensored Control	Sensored Tuning						MOTOR STATUS		
1	Device Configuration						^	Current Motor Speed (2)	Electrical S	peed 🕲
B	Driver Enable (1)	Mode (?)	Full Scale Voltage 🗇					0 RPM	0 Hz	
-@	Enable Driver	6x PWM (Pin tied tr *	60 v							
Ą	Motor Control						^	FAULT STATUS		Fault Settings
₩	MOTOR ENABLE @	Motor Direction @	Ramp Rate Delay 🛞	Motor Poles @			Set Motor Speed @	Phase Faults	VM	
B	► Start Motor	€ Reverse	100 PWN Cycle	B *					-	
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	Fault Configuration						^			
	Run OLP Test @	Run Diagnostics @	Clear Fault @	Enable Open Load Detection ⑦						
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							4		Ť	
							2	PHASE - A	PHASE - B	PHASE - C
					- /			=		B C

## Figure 8. DRV8343x-Q1EVM GUI - Hall Sensor Page (Motor Control and Tuning)

Sensorless Page (Motor Control and Tuning)

This page has different widget controls to control the motor and tune the parameters using the *Sensorless* algorithm as shown in Figure 9.

 Click on the DRV8343x-Q1EVM 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 with the sensorless algorithm:

- 1. Follow the steps in Section 2.1 and the DRV8343x-Q1EVM user's guide to correctly install the sensored project to the microcontroller.
- 2. When the GUI is on the Sensorless Control page, enable the driver by following these steps:
  - 1. Click on the ENABLE DRIVER 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.

3. 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 or equal to the *Minimum Duty Cycle* value.

4. Start the motor.

Click on the START MOTOR button to turn it green.

5. Under the Sensorless Tuning page, use the widgets under System parameter Controls, IPD Control, Open Loop Acceleration Control, and Closed Loop Acceleration Control to tune the motor.

When the value of a particular parameter is changed from the EVM GUI (by editing the value in any widget by sliding the slider or other editing means), the corresponding change is written to the firmware running on the microcontroller.

- 6. Monitor the right side panel*MOTOR STATUS and FAULT STATUS* to monitor the electrical speed, current motor speed and any faults present.
  - If any fault is present, the motor stops spinning and the corresponding fault is reported under *FAULT STATUS* section.
  - Perform the required actions to come out of the fault. For example, change the motor parameter values related to the fault.
  - For most cases, monitoring the *Phase Faults* diagram locates the actual error.
- 7. To run the open load diagnostics, click the Run OLP Test button.
- 8. Click the Run Diagnostics button to update the status in Phase Faults diagram.
- 9. Click the *Clear Fault* button to make the firmware try clearing a fault.



Sensorless Control Se	ensorless Tuning				MOTOR ST	ATUS		
evice Configuration					Current Moto	r Speed 💿	Electrical Spe	ed
river Enable 🛞	Mode Ø	Full Scale Voltage 🗇			0 RPM		0 Hz	
Enable Driver	6x PWM (Connect ) *	60 v					-	
lotor Configuration					FAULT	STATUS	J	Fault
Notor Rated Voltage @	Motor Rated Speed	Motor Poles @	BEMF Threshold @		Phase Faults		r.	
48 Volts	3200 RPM	8 *	100 counts					
otor Control					~ + <del>1</del>	∄  + \$	3	+1
NOTOR ENABLE @	Motor Direction @	Ramp Rate Delay 🗇	Motor Initial Position Mode: ②	Set Motor Speed @				L
► Start Motor	← Reverse	100 PWM Cycles	Six Pulse IPD *				→ B	_
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un OLP Test @	Run Diagnostics 🗇	Clear Fault 🗇	Enable Open Load Detection ③				ii.	
Run OLP Test	Run Diagnostics	Clear Fault			PHAS	E-A PHA	SE - B	P
		$\mathbb{V}(\mathbb{V})$				-1 <b>E</b>	7]≡	A B C

Figure 9. DRV8343x-Q1EVM GUI - Sensorless Page (Motor Control and Tuning)

Step 14. Independent Mode Page

This page has different widget controls to control one or more motors or loads such as solenoids using the independent mode algorithm as shown in Figure 10.

- Click on the DRV8343x-Q1EVM Independent Software User's Guide document link on the top of this page to understand independent mode operation and get details on each of the parameters on this page.
- Click on the question mark icon available on each of the controls in the GUI to understand operation and range of input values of that particular widget.

Follow these steps to run the required load or loads using Independent Mode algorithm:

- 1. Follow the steps in Section 2.1 and the DRV8343x-Q1EVM user's guide to correctly install the independent mode project to the microcontroller.
- Select the appropriate mode. Depending on the required mode, modification to the DRV8343x-Q1EVM board will be required. Refer to the DRV8343x-Q1EVM Independent Mode software User's Guide to understand all the configurations and controls available.
- 3. Configure the hardware based on the instruction provided in the following pages for all the phases.
- 4. When the hardware is configured for all the phases the high level control pages will appear.
- When the GUI is on the Independent Mode Control page, enable the driver by following these steps:
  - 1. Click on the ENABLE DRIVER 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.

- 6. Enable the half-bridge or independent FET as required.
- 7. Configure the ramp rate and duty cycles for the half-bridge or independent FET as necessary.
- 8. Monitor the phase current and phase sense voltage of each phase in the *Current Sense* panel.
- 9. Monitor the right side panel, FAULT/BRIDGE STATUS, for any faults present.



GUI Application

- If any fault is present, the motors or loads will stop driving and the corresponding fault is reported under the FAULT STATUS section.
- Perform the required actions to come out of the fault. For example, change the motor parameter values related to the fault.
- For most cases, monitoring the *Phase Faults* diagram locates the actual error.
- 10. To run the open load diagnostics, click the Run OLP Test button
  - 1. The *Phase Faults* diagram may show some false fault under independent mode.
  - 2. Refer to the DRV8343x-Q1 data sheet to understand under what modes the diagnostics of this part are not supported.
- 11. Click the Run Diagnostics button to update the status in the Phase Faults diagram.
- 12. Click the *Clear Fault* button to make the firmware try clearing a fault.

■ Mode          Independent Mode       Mode *       Mode *       Independent Half Bridge       Durket Do auber Bridge ©       CURRENT SENSE         Device Configuration       Independent Half Bridge       Ourveet Do auber Bridge ©       Phase A Gain ©       Phase B Gain ©       Phase B Gain ©       Phase A Gain ©       P	V8343-Q1 File Tools Help									
Independent Mode Mode *   Independent Mode Mode *   Independent MateBurge Mode *   Independent * </th <th>Menu</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>	Menu									
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Device Configuration   Diver finable Bridge   Diver finable Open Load   Device Configuration   Diver finable Open Load   Diver							Independent Half-Bridge	Phase A:	Phase B:	Phase C:
Driver finable @ Disable Bridge @ Phase A Gain @ Phase A Gain @ Fail Scale Voltage @   Disable Driver Disable Bridge Diver Diver GO   Programsy @ 20 20 30 5	Device Configuration						^	Sense Vout: 0 mV	Sense Vout: 0 mV	Sense Vout: 0 ml
Enable Driver       Disable Bridge       20 VV •       20 VV •       60 v         PWM Switching Frequency @       25       Max         25       Max         Run OLep Test @       Run Diagnostics @       Clear Fault @       Enable Open Load Detection -Phase B @       Enable Open Load Detection -Phase C	Driver Enable 🕲	Disable Bridge 🛞	Phase A Gain 🕲	Phase B Gain 🗇	Phase C Gain ③	Full Scale Voltage (2)			DGE STATUS	
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25 MAX     Pault Configuration     Run OLP Test: (b)     Run DLP Test: (b)     Run DLP Test: (b)     Run DLP Test: (c)     Run DLP Test: (c) <td>PWM Switching Frequency (9)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Phase Faults</td> <td></td> <td></td>	PWM Switching Frequency (9)							Phase Faults		
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Run DLignostics       Clear Fault       Image Configuration         Bridge Control -A Configuration -2       Bridge Enable (*)       Ramp Rate (*)       CHA Duty Cycle (*)       Image (	Run OLP Test 🕲	Run Diagnostics 🗇	Clear Fault @	Enable Open Load Detection - Phase A. Ø	Enable Open Load Detection - Phase B @	Enable Open Load Detection - Phase C (2)				c
Bridge Configuration     Image Enable @ Ramp Rate @ GHA Duty Cycle @ GLA Duty Cycl	Run OLP Test	Run Diagnostics	Clear Fault			۲				-
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andge Paule C Contiguration set titled	Bridge Phase C Configuration set failed	d								10 m

Figure 10. DRV8343x-Q1EVM GUI – Independent Mode Page

Step 15. Current Sense Page

The DRV8343x-Q1EVM monitors the current through three integrated low-side current sense amplifiers. All three amplifiers can be used to sense the current in each of the half-bridge sides. Through the GUI Current Sense page, the gain, offset calibration, unidirectional or bidirectional current sense can be controlled as shown in Figure 11.

- Click on the question mark icon available on each of the controls to understand operation of that particular widget.
  - 1. Select between unidirectional and bidirectional mode.
  - 2. Configurations can be done in the Current Sense Settings panel.
  - 3. Monitor the phase current and phase sense volt of each phase in the *Current Sense* panel when independent mode is selected.

**NOTE:** This panel will be visible only if the connected device is in independent mode.

- 4. Monitor the Fault Status panel.
  - 1. If any fault is present, the motor stops spinning and the corresponding fault is reported under the *FAULT STATUS* section.



- 2. Perform the required actions to come out of the fault. For example, change the motor parameter values related to the fault.
- 5. To run the open load diagnostics, click the Run OLP Test button.
- 6. Click the Run Diagnostics button to update the status in the Phase Faults diagram.
- 7. Click the Clear Fault button to make the firmware try to clear the fault.



Figure 11. DRV8343x-Q1EVM GUI – Current Sense Mode Page

#### Step 16. Smart Gate Drive Page

The DRV8343x-Q1EVM Smart Gate Drive architecture supports up to 1-A source ans 2-A sink peak gate drive current capability. The Smart Gate Drive GUI page provides the ability to dynamically adjust the output gate-drive current strength allowing for the gate drivers to control the power MOSFET VDS switching speed. Through the GUI Smart Gate Drive page, the IDRIVE, TDRIVE, and dead time settings can be adjusted for all three half-bridges as shown in Figure 12.

- Click on the question mark icon available on each of the controls to understand operation of that particular widget.
- For a demonstration of Smart Gate Drive operation, see the Smart Gate Drive video provided with the GUI.
- For more information on Smart Gate Drive architecture refer to the introduction page explanation.
  - 1. Select the *Device Configuration* panel.
  - 2. The graph will change according to the values set for the above controls.
  - 3. Monitor the Fault Status panel.
    - 1. If any fault is present, the motor stops spinning and the corresponding fault is reported under the *FAULT STATUS* section.
    - 2. Perform the required actions to come out of the fault. For example, change the motor parameter values related to the fault.
  - 4. To run the open load diagnostics, click the *Run OLP Test* button.
  - 5. Click the Run Diagnostics button to update the status in the Phase Faults diagram.
  - 6. Click the *Clear Fault* button to make the firmware try to clear the fault.



#### GUI Application

DRV8	1343-Q1 File Tools Help		- X ×
= 1	Menu		
*	Smart Gate Drive View Intro		FAULT STATUS Phase Faults
e	Device Configuration	^	
-00	IDRIVEP_H (1) TDRIVE (2) Dead Time (2) IDRIVEP_L	Set Max TDrive I	
Ą	1000 mA • 4000-ns peak gate • 1000-ns dead time • 1000 mA	• •	VM
ŧ	VDS_HS TSlew 3.4 ns	QGD : 6.7nC	
2	LGate_HS Hold 1Drive 4000 ns		
•	IDrive_N_HS 2000 mA		
	VDS_LS tSlew 6.7 ns		RSINGE RSINGE RSINGE
	LGate_LS Hold	215 1000 mA	↓ PHASE-A PHASE-B PHASE-C
	Fault Configuration       Run OLP Test     Run Diagnostics       Run OLP Test     Run Diagnostics         Clear Fault	A.	
8.	Not connected -		u Texas Instruments

Figure 12. DRV8343x-Q1EVM GUI – Smart Gate Drive Page

Step 17. 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, sensorless motor control settings, and independent mode motor control settings as shown in Figure 13.
  - **NOTE:** The user can save (and load) a particular configuration of the registers and the *Motor Control* parameters (as set on the *Motor Control* pages). This feature can also be used when no actual EVM is connected to the computer.



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**GUI** Application



### Figure 13. DRV8343x-Q1EVM GUI (File Toolbar Menu)

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 14. DRV8343x-Q1EVM GUI (Tools Toolbar Menu)

Help—This menu shows the information on this GUI application under the About option.



## GUI Application

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Figure 15. DRV8343x-Q1EVM GUI (Help Toolbar Menu)

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