

DRV10983 and DRV10975 Evaluation Module

This document provides complete details of DRV10983 and DRV10975 customer evaluation module (EVM) including its hardware implementation, jumper configuration, and operating procedure to run 3-phase BLDC motors. The guide pertains to four EVM configurations: two main configurations are DRV10983 and DRV10975, and depending upon operating mode each of two devices, EVMs are further sub-divided as Standby mode and Sleep mode. This EVM user's guide is intended to be used with the DRV10983 and DRV10975 Tuning Guide (SLOU395) to optimally tune a user motor.

Contents

| 1 | DRV1 | 0983 and DRV10975 EVM Kit Contents | . 3 |
|-------|---------|---|-----|
| 2 | Introdu | uction | . 3 |
| 3 | DRV1 | 0983 and DRV10975 EVM Board | . 4 |
| | 3.1 | Power and Motor Connectors P1 | . 4 |
| | 3.2 | Test Point Connector P2 | . 4 |
| | 3.3 | Control Input Connectors J3 | . 4 |
| | 3.4 | Jumper J1 (Direction) | . 4 |
| | 3.5 | Jumper J2 (Speed Input) | . 5 |
| | 3.6 | FG Test Pin | . 5 |
| 4 | DRV1 | 0983 and DRV10975 GUI | . 6 |
| | 4.1 | Overview | . 6 |
| | 4.2 | Basic Settings | . 6 |
| 5 | Out-of | -the-Box Quick Start Guide | 10 |
| 6 | Power | -on Sequence and Connection With User Specific Motor | 16 |
| 7 | Schem | natic and Bill of Materials | 17 |
| | 7.1 | Schematic | 17 |
| | 7.2 | Bill of Materials (BOM) | 18 |
| Appen | dix A | GUI Installation and Overview | 19 |
| Appen | dix B | GUI to DRV10983 and DRV10975 Register Cross Reference | 41 |

List of Figures

| 1 | DRV10983 EVM with Standby Device | 3 |
|----------------|--|----|
| 2 | DRV10983 GUI Basic Settings | 6 |
| 3 | DRV10983 GUI Advanced Settings | 8 |
| 4 | DRV10983 GUI Display Settings | 9 |
| 5 | Initial GUI Screen | 11 |
| 6 | GUI in Simulation Mode | 12 |
| 7 | Enable Configure | 13 |
| 8 | Disable Sleep Mode | 14 |
| 9 | Runtian EVM Motor | 15 |
| 10 | TelcoMotion EVM Motor | 15 |
| 11 | Load Motor Parameters | 15 |
| 12 | OverRide Selected | 16 |
| 13 | DRV10983 and DRV10975 Schematic | 17 |
| 14 | Setup.exe from the Volume Folder | 19 |
| 15 | GUI Installation Initialization | 20 |
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1



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|----|---------------|----|------|--------|---|
| V | <i>u uu</i> ' | vv | | | |
| | | | •••• | ~~ | |
| | | | | | |

| 16 | GUI Destination Directory | 20 |
|----|---|----|
| 17 | GUI License Agreement | 21 |
| 18 | GUI Start Installation | 21 |
| 19 | GUI Installation in Progress | 22 |
| 20 | GUI Installation Complete | 22 |
| 21 | Python Installation Complete | 23 |
| 22 | USB2ANY Installation Initialization | 23 |
| 23 | USB2ANY License Agreement | 24 |
| 24 | USB2ANY Destination Directory | 24 |
| 25 | USB2ANY Start Installation | 25 |
| 26 | USB2ANY Installation Progress | 25 |
| 27 | USB2ANY Installation Complete | 26 |
| 28 | LabVIEW RTE Installation Initialization | 27 |
| 29 | LabVIEW RTE Select Features | 28 |
| 30 | LabVIEW RTE License Agreement | 28 |
| 31 | LabVIEW RTE Start Installation | 29 |
| 32 | LabVIEW RTE Installation in Progress | 29 |
| 33 | LabVIEW RTE Installation Complete | 30 |
| 34 | Basic Settings Page | 31 |
| 35 | Confirmation on Voltage Level | 32 |
| 36 | Help Icon | 33 |
| 37 | Advanced Settings | 33 |
| 38 | Display | 34 |
| 39 | About Page | 35 |
| 40 | File Menu | 35 |
| 41 | Script Menu | 36 |
| 42 | Launch Macro | 36 |
| 43 | Start Recording | 37 |
| 44 | Stop Recording | 38 |
| 45 | Run Macro | 39 |
| 46 | Debug Menu | 40 |
| | | |

List of Tables

| 1 | DRV10983 and DRV10975 Bill of Materials | 18 |
|---|---|----|
| 2 | GUI to DRV10983 and DRV10975 Register Cross Reference | 41 |

2

1 DRV10983 and DRV10975 EVM Kit Contents

The DRV10983 and DRV10975 evaluation kit contains following:

- 1. DRV10983 and DRV10975 EVM board
- 2. USB2ANY communication board for I2C GUI interaction
- 3. USB cable
- 4. 10-pin ribbon cable to connect USB2ANY and DRV10983 and DRV10975 EVM
- 5. DRV10983 and DRV10975 EVM GUI
- 6. A Runtian 3-phase BLDC motor, model number ZWL12_22_2.5A, or Telco model DT4260-24-055-04H

The DRV10983 and DRV10975 EVM boards and GUI are designed to work together to evaluate the device features.

2 Introduction

The DRV10983 and DRV10975 EVM is a complete solution for evaluating the DRV10983 24-V and DRV10975 12-V, Three-Phase Sensorless BLDC motor drivers. Device evaluation and configuration for specific applications is possible with the provided DRV10983 and DRV10975 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. There are four identifications marks on EVM ⁽¹⁾ to help the user easily identify the right configuration. For example, Figure 1 shows the EVM using the DRV10983 standby device. For detailed information about operating modes of the DRV10983 and DRV10975 devices, refer to their data sheets (SLVSCP6) and (SLVSCP2), respectively.



Figure 1. DRV10983 EVM with Standby Device

(1) There are two revisions of the DRV10983 and DRV10975 EVM. The REV-A board uses only two identification marks to distinguish between DRV10983 and DRV10975. The latest REV-B board uses two additional identifications marks to distinguish between Standby and Sleep mode parts.

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3 DRV10983 and DRV10975 EVM Board

3.1 Power and Motor Connectors P1

The DRV10983 and DRV10975 EVM shares terminal P1 for power supply and motor phase output. To operate the EVM, a single power supply rail between 8 to 28 V for DRV10983 EVM and 6.5 to 18 V for DRV10975 EVM (depending on the motor requirements) is necessary. For DRV10975 EVM, nominal voltage is 12 V, and for DRV10983, nominal voltage is 24 V. The pin assignment of terminal P1 is as follows:

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

3.2 Test Point Connector P2

Connector P2 can be used to measure signals from the DRV10983 and DRV10975. P2 is not populated. The pin assignment is as follows:

| Pin | Description |
|-----|--|
| 1 | VCP, charge pump output |
| 2 | GND |
| 3 | VR, VREG output |
| 4 | V3P3 |
| 5 | SD from J3 (connects to SDA of device) |
| 6 | SC from J3 (connects to SCL of device) |
| 7 | SP, SPEED input from PWMIN or R14 |

3.3 Control Input Connectors J3

The connector J3 is used for the I2C interconnection with the GUI. The pin assignment is as follows:

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

3.4 Jumper J1 (Direction)

4

In order to control the spin direction of the motor, the DRV10983 and DRV10975 EVM is equipped with a direction jumper. Depending if 3V3 or GND is supplied to the DRV10983 and DRV10975 direction input, the motor spins either in forward or reverse direction.

| DIR-GND | J1 Connection | Description |
|---------|---------------|---------------------------|
| | unconnected | DIR is set to 3.3V |
| Ji | 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 R14 equipped on the EVM.

| | J2 Connection | Description |
|-----------------|---------------|-----------------------------|
| | 1 – 2 | Analog Pot R14 |
| ANALOG | 2-3 | PWMIN digital input (shown) |
| | | |
| N _{J2} | | |

NOTE: The motor operation may be unpredictable if the DRV10983 and DRV10975 internal register setting does not match the J2 selection.

3.6 FG Test Pin

The FG test pin outputs the motor speed, depending on the internal DRV10983 and DRV10975 divider setting and the number of motor poles.

5

4 DRV10983 and DRV10975 GUI

4.1 Overview

The DRV10983 and DRV10975 EVM is provided with a GUI to configure the device and tune the application. Refer to Appendix A to download and install 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 datasheet (SLVSCP6) and DRV10975 datasheet (SLVSCP2).

In following sections, DRV10983 GUI images are shown to explain the various features of GUI. The same applies for DRV10975 devices unless otherwise specified.

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.

| DRV10983 EVM GUI Simulate Communication High Level Configura Basic Settings Advanced Settings Display High Level Configura Basic Settings Advanced Settings Display PD Setting IPD Setting Basic Settings Manual Refrests PD Lonchav Enable IPD Initial Speed Detect Initial Speed Detect Initial Speed Detect Initial Speed Detect Manual Refrests Current Limit Acceleration Current Limit No Software IPD Advance Angle 30 deg IPD Clock 12 Hz IPD Release Mode Brake Startup Setting Motor Parameters IPD Release Mode Full cycle Speed Input Mode Analog Input Startup Setting AlignTime 5.3 s Imase Resistance (Q) Imase Resistance (Q) <t< th=""><th>ile Script Debug He</th><th>lp</th><th></th><th></th></t<> | ile Script Debug He | lp | | |
|--|--|---|---|-----------------------------|
| Basic Settings Advanced Settings Display High Level Configure IPD Setting Manual Refresh O Display Enable IPD [Initial Speed Detect [Initial Speed Detect [IPD Current Threshold (A) No IPD function Enable IPD [Initial Speed Detect [Initia | | D | RV10983 EVM GUI | ✓ Simulate Communication |
| IPD Setting IPD Setting IPD Setting IPD Setting IPD Lock IPD Setting IPD Current Threshold (A) NO IPD function IPD Courrent Threshold (A) IPD Courrent Threshold (A) IPD Courrent Threshold (A) IPD Courrent Threshold (A) IPD Release Mode Brake | High Lovel Configure | Basic Settings | Advanced Settings | Display |
| Ahnuit Enable IPD IPD Current Threshold (A) No IPD function IPD Advance Angle 30 deg IPD Clock 12 Hz IPD Release Mode Brake IPD Release Mode Brake IPD Release Mode Brake Speed Input Mode Full cycle Speed Input Mode Inf fast Closed Loop Accelerate Inf fast Control Coefficient Setting 0.25 Commutate Control Advance (s) 0 Mode 0 T Control Advance (s) 0 | Rasic Settings Advanced Settings Display | IPD Setting | Before Startup | Manual Refresh |
| IPD Advance Angle 30 deg Enable Reverse Drive Image: Closed Loop Setting IPD Release Mode Brake Brake Brake Done Threshold No Brake Motor Parameters IPD Release Mode Full cycle Startup Setting AlignTime 5.3 s Phase Resistance (Ω) 0 AdjMode Full cycle Startup Setting AlignTime 5.3 s Phase to Phase Kt (mV/Hz) 0 Speed Input Mode Analog Input Second Order Accelerate 76 Hz/s Second Order Accelerate 57 Hz/s2 Open to Closed Loop Not Applicable Motor Configuration Commutate Control Advance (s) 0 Open Loop Current 0.2 A Motor Configuration Open Loop Current 0.2 A Open Loop Current 0.2 A Open Loop Current 0.2 A | Ahout | Enable IPD IPD Current Threshold (A) No IPD function | Enable Initial Speed Detect Initial Speed Detect 6 Hz (80ms no Initial Speed Detect 7 Threshold 6 Hz (80ms no Initial Speed States) | Current Limit |
| IPD Release Mode Brake Brake Constant Time Closedloop Setting Startup Setting AdjMode Full cycle Speed Input Mode Analog Input Closed Loop Accelerate Inf fast Control Coefficient Setting 0.25 Mode Open Loop Current 0.2 A Control Advance (s) 0 | | IPD Advance Angle 30 deg IPD Clock 12 Hz | Enable Reverse Drive Reverse Drive/Brake Chrocobold 6.3 Hz | |
| Closedloop Setting Startup Setting AdjMode Full cycle AdjMode Full cycle Speed Input Mode Analog Input Speed Input Mode Analog Input Closed Loop Accelerate Inf fast Control Coefficient Setting 0.25 Mode Constant Time Mode Constant Time Open Loop Current 0.2 A | | IPD Release Mode Brake | Brake Done Threshold No Brake | Phase Resistance (Ω) 0 |
| Speed Input Mode Analog Input Speed Input Mode Analog Input Closed Loop Accelerate Inf fast Control Coefficient Setting 0.25 Commutate Control Advance Constant Time Mode Open Loop Current Open Loop Current 0.2 A | | AdiMode Full cycle | AlianTime 535 | Phase to Phase Kt (mV/Hz) 0 |
| Closed Loop Accelerate Inf fast Second Order Accelerate 57 Hz/s2 Control Coefficient Setting 0.25 Commutate Control Advance Constant Time Constant Time Control Advance (Source Constant Time Control Advance (Source Constant Time Control Advance (Source Control Advance (S | | Speed Input Mode Analog Input | First Order Accelerate 76 Hz/s | Enable Configure eeRefresh |
| Commutate Control Advance Constant Time Open Loop Current rate 6 VCC/s Load Save T Control Advance (s) 0 0 Open Loop Current 0.2 A Cleare Dia | | Closed Loop Accelerate Inf fast 🗾 Control Coefficient Setting 0.25 💌 | Second Order Accelerate 57 Hz/s2 Open to Closed Loop Threshold Not Applicable | EEPROM Key × 0 @ eeWrite |
| | | Commutate Control Advance Mode | Open Loop Current rate 6 VCC/s Open Loop Current 0.2 A | Load Save |
| • CLOOPDIS · | - | | CLoopDis | |

Figure 2. DRV10983 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. Select *Simulate Communication* on the top right to work offline. When the EVM is connected to the GUI, this box should be unchecked and the bar at the bottom shows *Connected*. If the GUI cannot connect to the hardware, check that the hardware is powered and the I2C communication is correctly established.

4.2.2 Register Access – Enable Configure

To access the register settings, left click the Enable Configure button. Refer to Figure 2. Once selected, the button changes to green and the settings can change.

4.2.3 Changing Register Settings

The GUI supports three different input types to set the register values:

- 1. Dropdown list to select a predefined setting. An example is shown to the right. CLoopDis Open Loop Current 0.2 A 0.4 A 0.8 A ✓ 1.6 A
- 2. Checkbox to set single bit values. An example with the selection enabled is shown to the right.

IPD Setting

 Text boxes (user input data might be changed by the device due to data type conversations). 1.5 was entered, 1.54 is the nearest value and was selected.

| Motor Parameters | | |
|----------------------|------|--|
| Phase Resistance (Ω) | 1.54 | |

Enable IPD 🔽

4.2.4 Work with EEPROM

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

To program the DRV10983 and DRV10975 devices and change the default EEPROM settings, follow the instructions of the DRV10983 datasheet (SLVSCP6) and DRV10975 datasheet (SLVSCP2).



4.2.4.1 Advanced Settings

The Advance settings tab controls functions such as lock detection, anti-voltage surge function, dead time, PWM frequency, and the Buck Regulator output voltage.

| DRV10983 EVM GUI | | | |
|---|--|---|---------------------------------|
| File Script Debug Help |) | | |
| | DRV109 | 983 EVM GUI | Simulate Communication |
| Selection | Basic Settings | Advanced Settings | Display |
| Advanced Settings Advanced Settings About | Lock Detect | AVS (Anti-voltage Surge) Function | Manual Refresh |
| | Current Limit 🔲 No Motor Fault 📋 | Enable Inductive AVS | |
| | Speed Abnormal 📋 Open Loop Stuck 📋 | Enable Mechanical AVS | |
| | BEMF Abnormal Closed Loop Stuck | Mechanical AVS Mode AVS to VCC | |
| | Abnormal Kt lock detect Threshold Kt_high = 3/2Kt. | FG Options | |
| | | FG Open Loop Output Select Output FG in | |
| | PWM output Options | FG Cycle Select FG 4pole | • |
| | Dead Time between HS and LS gate drive 40 ns | Device Options | |
| | Double the output PWM frequency | Buck Regulator Voltage select | 5 V 💌 |
| | | | |
| Idle | | 1.0.0.4 | connected 🛛 🐺 Texas Instruments |

Figure 3. DRV10983 GUI Advanced Settings

8

4.2.4.2 Display

The Display tab monitors the device status and motor parameters.

The left side 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 side shows the device status. An active fault condition lights the red indication.

Control the motor speed from the GUI with the speed control in the bottom right. To control the motor speed using the GUI, check the OverRide bit and set the motor speed from 0 to 511 decimal.

| DRV10983 EVM GUI | | | | | | | |
|--|--|-----------|-----------------------------|-------|------------------------------------|--------------------------------|-------------|
| File Script Debug Help | | | | | | | |
| | | DR | V10983 | EVM | GUI | 📄 Simulate Communicatio | n |
| Selection ^ | Basic Settings | | | Advan | ced Settings | Displa | у |
| Basic Settings Advanced Settings Anout About | Display | | RESH Manual RESH Refresh | | Device Status | AUTO REFRESH Manual Refresh | |
| | Pole | 1 0 Hz | 0 | rpm | Lock 🔴 Sle | ep/Standby | |
| | Electrical Period (us) | 0 | | | OverTemp 🔮 C | OverCurrent | |
| | Supply voltage (V) | NaN 0 | | | Speed Control | Manual Refresh | |
| | Speed Command (%) Speed Cmd Buffer (%) | 0 | | | Disable the Sleep/Standby N Ove | Node | |
| | Fault Code | 0 1 2 | 3 4 5 | | Speed | 0 🔮 Stop | |
| Idle | | | | | 1.0.0.4 | CONNECTED 🛛 🐺 TEXAS | INSTRUMENTS |

Figure 4. DRV10983 GUI Display Settings

9

DRV10983 and DRV10975 GUI



Out-of-the-Box Quick Start Guide

5 Out-of-the-Box Quick Start Guide

The DRV10983 and DRV10975 evaluation kit comes with Runtian or Telco 3-phase BLDC motor as part of hardware package. Use this motor as a first step to get familiar with operating procedure of EVM before attempting to run the user specific motor. This section assumes that user has already downloaded the DRV10983 and DRV10975 application GUI as mentioned in Appendix A.

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

- 1. Do not connect the motor phases and ensure that jumper J2 is set to analog.
- For DRV10983 and DRV10975 Standby mode devices, set the speed input to 0 by rotating the potentiometer R14 fully counterclockwise. For DRV10983 and DRV10975 Sleep mode devices, set the speed input to maximum by rotating the potentiometer R14 fully clockwise.
- 3. Only with DRV10983 and DRV10975 EVMs with Standby mode devices, connect the motor phases of the user motor to connector P1. Phase sequence is not important as it only determines the direction of rotation.

CAUTION

Do not connect the motor phases for EVMs with sleep mode devices.

- 4. Connect the USB2Any board to your computer using the supplied USB cable. Then connect the 10-pin ribbon cable header to J4 on the USB2Any board and J3 on the DRV10983 and DRV10975 EVMs.
- 5. Connect a power supply to VCC (pin1) and GND (pin 5) of connector P1. Power on EVM with VCC: For the DRV10975 EVM apply 12 V, and for the DRV10983 EVM apply 24 V.

CAUTION

With VCC, never exceed 18 V on DRV10975 EVMs and 28 V on the DRV10983 EVMs during motor operation.



6. Launch the DRV10983-75.exe application on the computer. Select the appropriate device configuration as shown in Figure 5 and press OK.

The following GUI images will appear for DRV10983 EVMs only, but the same images and operating steps are applicable for DRV10975 EVMs.



Figure 5. Initial GUI Screen



Out-of-the-Box Quick Start Guide

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 If Simulate Communication was enabled previously, the following GUI screen image would appear as shown in Figure 6. Uncheck the Simulate Communication box to go to next step. Otherwise, the GUI screen image shown in Step 8 will appear directly, after Step 6.

| 🐶 DRV10983 EVM GUI | | | |
|------------------------|---|---|------------------------------------|
| File Script Debug Help | | | |
| | D | RV10983 EVM GUI | Simulate Communication |
| Selection | Basic Settings | Advanced Settings | Display |
| | IPD Setting | Before Startup | Manual Refresh |
| ♦ About | Enable IPD | Enable Initial Speed Detect | Current Limit |
| | IPD Current Threshold (A) No IPD function | Initial Speed Detect Threshold 6 Hz (80ms no 💌 | Acceleration Current Limit Disable |
| | IPD Advance Angle 30 deg 💌 | Enable Reverse Drive | |
| | IPD Clock 12 Hz | Reverse Drive/Brake 6.3 Hz | Motor Parameters |
| | IPD Release Mode Brake 💌 | Brake Done Threshold No Brake 💌 | Phase Resistance (Q) |
| | Closedloop Setting | Startup Setting | |
| | AdjMode Full cycle adjustment 💌 | AlignTime 5.3 s | |
| | Speed Input Mode Analog Input 💌 | First Order Accelerate 76 Hz/s 💌 | Enable Configure 🛛 eeRefresh |
| | Closed Loop Accelerate Inf fast 💌 | Second Order Accelerate 57 Hz/s2 | |
| | Control Coefficient Setting 0.25 | Open to Closed Loop Threshold Not Applicable 💌 | Motor Configuration |
| | Commutate Control Advance Constant Time 💌 | Open Loop Current rate 6 VCC/s | Load Save |
| | T Control Advance (s) 0 | Open Loop Current 0.2 A 💌 | |
| - | | CLoopDis 📃 | |
| Idle | | 1.1.0.0 | SIMULATION 🌵 TEXAS INSTRUMENTS |

Figure 6. GUI in Simulation Mode



8. CONNECTED should turn green, indicating that the GUI is communicating with the device. Select Enable Configure to turn the button to green as well (see Figure 7).

| 💀 DRV10983 EVM GUI | | | |
|------------------------|---|---|--------------------------------------|
| File Script Debug Help | | | |
| | D | RV10983 EVM GUI | Simulate Communication |
| Selection | Basic Settings | Advanced Settings | Display |
| | IPD Setting | Before Startup | Manual Refresh |
| ♦ About | Enable IPD | Enable Initial Speed Detect 🔽 Initial Speed Detect | Current Limit |
| | IPD Advance Angle 30 deg 💌 | Threshold Lio H2 (320H) Enable Reverse Drive | Acceleration Current Limit Disable 💌 |
| | IPD Clock 95 Hz | Reverse Drive/Brake 6.3 Hz | Motor Parameters |
| | IPD Release Mode Tri-state 💌 | Brake Done Threshold No Brake 💌 | Bhase Resistance (Q) 1.22 |
| | Closedloop Setting | Startup Setting | Phase to Phase Kt (mV/Hz) 440 |
| | AdjMode Full cycle adjustment 💌 | AlignTime 0.04 s | |
| | Speed Input Mode PWM Input 💌 | First Order Accelerate 0.9 Hz/s | Enable Configure 🛛 eeRefresh |
| | Closed Loop Accelerate 0.045 VCC/s 💌 | Second Order Accelerate 0.66 Hz/s2 | EEPROM Key 🗴 0 🔮 🛛 eeWrite 🔮 |
| | Control Coefficient Setting 1 | Threshold 10.4Hz | Motor Configuration |
| | Commutate Control Advance Constant Time Mode | Open Loop Current rate 0.7 VCC/s | Load Save |
| | T Control Advance (s) 480u 🔮 | Open Loop Current 0.8 A 💌 | |
| - | | CLoopDis 🔲 | |
| Idle | | 1.1.0.0 | CONNECTED 🌵 TEXAS INSTRUMENTS |

Figure 7. Enable Configure



Out-of-the-Box Quick Start Guide

9. In the Display tab, disable Sleep mode as shown in Figure 8

| DRV10983 EVM GUI | | | | | | _ D _ X |
|---|--|------------------------------|----------------|--------------------------------------|-------------------------|----------------|
| File Script Debug Help | | | | | | |
| | | DF | RV10983 EVM | GUI | Simulate Communication | |
| Selection | Basic Settings | | Adv | anced Settings | Display | |
| → Basic Settings → Advanced Settings → Display ◇ About | Display | • AL | Manual Refresh | Device Status | AUTO REFRESH Refresh | |
| | Pole Motor Speed Electrical Period (us) Motor Velocity Constant (mV/Hz) | 1 24.7 Hz 42490 0.5 | z 2824.19 rpm | Lock 🥚 Sleep OverTemp 🕘 Ov | o/Standby 🥚 | |
| | IPD Position (degree) Supply voltage (V) Speed Command (%) | 0 23.3203 | | Speed Control | Manual Refresh | |
| | Speed Cmd Buffer (%) | 0 | | Disable the Sleep/Standby Mo Over | nde 🗹 | |
| | Fault Code | 0 1 2 | 3 4 5 | 1.1.0.0 | 0 V Stop | INSTRUMENTS |

Figure 8. Disable Sleep Mode

For DRV10983 and DRV10975 EVMs with Sleep mode devices, Potentiometer R14 can be brought back to zero by rotating counterclockwise because Sleep mode is disabled and it will not cause issue with the GUI. Now motor can be connected at P1 to Sleep mode EVMs.

CAUTION

Do not short motor phases to VCC at connector P1, specifically P1-2 (Wphase) to P1-1(VCC) because EVM is in power-on condition.

10. Switch back to the Basic Settings tab. Load the parameters for the supplied motor. Select Load, and a new window appears. Depending on which motor the kit came with, select the associated file. See Figure 9 and Figure 10 for the different motors and their accompanying file names. Both files are located in the downloaded GUI software folder. Browse to the folder and select the correct file name for the motor. Click Okay to configure the registers for the motor provided.



Figure 9. Runtian EVM Motor



Figure 10. TelcoMotion EVM Motor

| NRV10983 EVM GUI | | | |
|---------------------------|--|--|---------------------------------------|
| File Script Debug Help | | | |
| | DRV | L0983 EVM GUI | Simulate Communication |
| Selection - Select a Moto | r Configuration file to load | | Display |
| | 🕌 Volume | • 🧿 🎓 🗁 🛄 • | Manual Refresh |
| → Display ♦ About | Name 🔓 | Date modified Type 1/5/2015 4:15 PM File folder | Current Limit |
| Recent Places | license supportfiles Runtian_ZWL12_22_2p5A.csv telcomotion_DT4260.csv | 1/5/2015 4:15 PM File folder 1/5/2015 4:15 PM File folder 9/8/2014 4:04 PM Microsoft 8/1/2014 9:57 AM Microsoft | Acceleration Current Limit Disable |
| | | | Motor Parameters |
| | | | Phase Resistance (Ω) 1.23 |
| Computer | | | Phase to Phase Kt (mV/Hz) 440 |
| Network | (| → OK → Cancel | |
| Control Coeffic | ient Setting 1 | Threshold | Mater Configuration |
| Commutate Contr | ol Advance Mode Constant Time 🗨 C | Open Loop Current rate 0.7 VCC/s | Load Save |
| T Control | Advance (s) 480u | Open Loop Current 0.8 A | |
| - | | CLoopDis | |
| Idle | | | 1.1.0.0 CONNECTED 👋 TEXAS INSTRUMENTS |

Figure 11. Load Motor Parameters

- 11. Turn the pot R14 clockwise. The motor speed increases as the pot is turned clockwise, and decreases as the pot is turned counter clockwise.
- 12. Change the motor direction by connecting or removing jumper J1.



13. Override the analog speed control by switching to the Display tab and select the OverRude box.

| DRV10983 EVM GUI | | | | | |
|---|---|-----------------------------------|---------------------------|-----------------------------------|--------|
| File Script Debug Help | | | | | |
| | | DRV10983 EVM | GUI | Simulate Communication | |
| Selection | Basic Settings | Advi | anced Settings | Display | |
| Advanced Settings Advanced Settings Advanced Settings Advanced Settings Advanced Settings | Display | AUTO REFRESH Manual Refresh | Device Status | AUTO REFRESH Manual Refresh | |
| | Pole Motor Speed Electrical Period (us) | 1 24.7 Hz 2822.2 rpm | Lock 🔴 S | leep/Standby | |
| | Motor Velocity Constant (mV/Hz) | 3757.3 | | | |
| | Supply voltage (V) | 23.3203 | Speed Control | Manual Refresh | |
| | Speed Command (%) Speed Cmd Buffer (%) | 100 0 | Disable the Sleep/Standby | Mode 🔽 | |
| | Fault Code | 0 1 2 3 4 5 | Speed | d 0 Stop | |
| Tdle | | | 1.1.0.0 | CONNECTED 🛛 🚸 TEXAS INSTRU | JMENTS |

Figure 12. OverRide Selected

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

15. When complete, set the speed to 0 and uncheck the OverRide checkbox.

6 Power-on Sequence and Connection With User Specific Motor

Once the supplied motor is evaluated, a user motor can be evaluated. The DRV10983 and DRV10975 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 mentioned in Section 5 to avoid any damage to EVM.

In order to successfully tune user motor, refer to the DRV10983 and DRV10975 Tuning Guide (SLOU395).



7 Schematic and Bill of Materials

This section contains the DRV10983 and DRV10975 schematic and bill of materials (BOM).

7.1 Schematic

Figure 13 shows the DRV10983 and DRV10975 schematic.



Figure 13. DRV10983 and DRV10975 Schematic

Schematic and Bill of Materials

7.2 Bill of Materials (BOM)

Table 1 lists the DRV10983 and DRV10975 EVM bill of materials.

| Designator | Description | Manufacturer | PartNumber | Quantity |
|------------------------|--|-----------------------------|---------------------------|----------|
| !PCB | Printed Circuit Board | Any | 10975/983 | 1 |
| C1 | CAP, CERM, 10 uF, 10 V, +/-20%, X5R, 0603 | ТDК | C1608X5R1A106M | 1 |
| C2, C3 | CAP, CERM, 1 uF, 25 V, +/-10%, X5R, 0603 | ТDК | C1608X5R1E105K080AC | 2 |
| C4, C5, C7 | CAP, CERM, 0.1 uF, 50 V, +/-10%, X7R, 0603 | AVX | 06035C104KAT2A | 3 |
| C6 | CAP, CERM, 4.7 uF, 50 V, +/-10%, X5R, 0805 | ток | C2012X5R1H475K125AB | 1 |
| FG, PWMIN, TP1, TP2 | Test Point, Compact, SMT | Keystone | 5016 | 4 |
| GND2 | Shorting Plug, 1MM uninsulated | Harwin Inc | D3082-05 | 1 |
| H9, H10, H11, H12 | Bumpon, Hemisphere, 0.44 X 0.20, Clear | ЗМ | 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 |
| L1 | Inductor, Shielded Drum Core, Ferrite, 47 uH, 1.15 A, 0.216 ohm, SMD | Coiltronics | DR74-470-R | 1 |
| P1 | Terminal Block, 5-pin, 15-A, 5.1mm | OST | D120/5DS | 1 |
| R5, R6, R7 | RES, 4.75k ohm, 1%, 0.1 W, 0603 | Vishay-Dale | CRCW06034K75FKEA | 3 |
| R14 | Potentiometer, Carbon, 1/8W, Horiz. Adjust | СТЅ | 296XD253B1N | 1 |
| R15 | 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 |
| U1 | IC, Motor Driver 3 Phase | Texas Instruments | DRV10983 and DRV10975 (1) | 1 |
| Motor | Runtian 3-phase BLDC motor | Runtian | ZWL12_22_2.5A | 1 |

Table 1. DRV10983 and DRV10975 Bill of Materials

 $^{(1)}$ $\,$ U1 part number can be any of the following depending on the EVM:

1. For Standby mode EVM: DRV10975PWP or DRV10983PWP

2. For Sleep mode EVM: DRV10975Z or DRV10983Z



Appendix A SLOU393C–July 2014–Revised January 2015

GUI Installation and Overview

The following 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

- 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 DRV10983/75 GUI. The installer also installs Python 2.7, USB2ANY SDK along with the GUI installation.

1. Double click on setup.exe from the Volume folder as shown in Figure 14.

| Organize 👻 🖻 Ope | n Share with 🔹 New folder | | • == | |
|---------------------|-----------------------------|--------------------|---------------------|------|
| 🚖 Favorites | Name | Date modified | Туре | Size |
| 📰 Desktop | 👢 bin | 9/16/2014 12:18 PM | File folder | |
| 🐌 Downloads | license | 9/16/2014 12:18 PM | File folder | |
| laces Recent Places | supportfiles | 9/16/2014 12:18 PM | File folder | |
| | nidist.id | 8/1/2014 9:57 AM | ID File | |
| 🞇 Libraries | README.rtf | 8/1/2014 9:57 AM | Rich Text Format | 3 |
| Documents | 🐁 Runtian_ZWL12_49_2p5A.csv | 9/8/2014 4:04 PM | Microsoft Excel Co | |
| 📣 Music | <u>setup.exe</u> | 8/1/2014 9:57 AM | Application | 1.39 |
| lictures | 🚳 setup.ini | 8/1/2014 9:57 AM | Configuration setti | |
| 💐 Videos | telcomotion_DT4260.csv | 8/1/2014 9:57 AM | Microsoft Excel Co | |
| 🦢 OSDisk (C:) | | | | |
| | | | | |

Figure 14. Setup.exe from the Volume Folder

2. A screen shown in Figure 15 appears. Press the *Next* >> button.

| 4 DRV10983-75 | |
|--|--------|
| It is strongly recommended that you exit all programs before running this installer. Applications that run in the background, such as virus-scanning utilities, might cause the installer to take longer than average to complete. | |
| | |
| << Back Next >> | Cancel |

Figure 15. GUI Installation Initialization

3. Set the destination directories for the GUI installation and press the *Next* >> button as shown in Figure 16. It is recommended to keep the default values as provided in the installer.



Figure 16. GUI Destination Directory



4. The *License Agreement* screen appears as shown in Figure 17. Read through the agreement carefully and enable the "I Accept the License Agreement" radio button, then press the *Next* button.

| URV10983 | |
|---|--|
| License Agreement You must accept the licenses displayed below to proceed. | |
| GUI Software Evaluation and Internal Use License Agree | ement |
| Important - Please read the following license agreement carefully, binding agreement. After you read this license agreement, you whether you accept and agree to the terms of this license agreement "I have read and agree" unless: (1) you are authorized to accept terms of this license agreement on behalf of yourself and your of you intend to enter into and to be bound by the terms of this agreement on behalf of yourself and your company. | This is a legally bu will be asked eent. Do not click and agree to the company; and (2) s legally binding |
| I accept the License Agr I do not accept the License Agr | reement. nse Agreement. |
| << Back Next | >> Cancel |

Figure 17. GUI License Agreement

5. The screen shown in Figure 18 appears. Click *Next* >> to begin installation.

| 4 DRV10983-75 | | x |
|---|----------------|---|
| Start Installation Review the following summary before continuing. | | |
| Adding or Changing • DRV10983-75 Files Click the Next button to begin installation. Click the Back button to change the installation settings | | |
| | | |
| Save File) << Back Next >> | <u>C</u> ancel | |

Figure 18. GUI Start Installation



Installation Procedure

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6. The installer begins self-extraction and proceeds with the installation as shown in Figure 19.

| 🐙 DRV10983-75 | | |
|--------------------------------|-------------|--------|
| | | |
| | | |
| | | |
| | | |
| Uverall Progress: 25% Complete | | |
| | | |
| Validating install | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | <pre></pre> | Cancel |

Figure 19. GUI Installation in Progress

7. The *Installation Complete* screen (Figure 20) appears, providing the link for LabVIEW Runtime Engine. This denotes the completion of DRV10983/75 GUI Installation.

| 🐙 DRV10983-75 | | |
|---|-------------|---|
| Installation Complete | | |
| | | |
| LabVIEW Runtime Engine is required to run the DRV10983-75 GUI Executable. Please install the Run-Time Engine from the below link, <u>after the</u> current Installation is complete. < <u>http://www.ni.com/download/labview-run-time-engine-2010-sp1/229</u> | e 2/en/> | |
| | |] |
| << Back Next >> | Finish | |

Figure 20. GUI Installation Complete



8. After the installation of the GUI, Python installation initiates. Once python is installed, a screen as shown in Figure 21 appears. Click the *OK* button to proceed with USB2ANY installation.

| C:\Windows\system32\cmd.exe | | | 22 |
|---|-------|-----------|----------|
| C:\Users\x0220544\Desktop\Volume>C: CRLF | | | A |
| C:\Users\x0220544\Desktop\Volume>cd C:\Users\x0220544\AppData\Local\ | Гемр` | | - |
| C:\Users\x0220544\AppData\Local\Temp}call Installpython.bat ALLUSERS= | L ∕q] | <u>b+</u> | |
| C:\Users\x0220544\AppData\Local\Temp Python 2.7.2 | X | | |
| C:\Users\x0220544\AppData\Local\Temp | | b, | Image: 1 |
| C:\Users\x0220544\AppData\Local\Temr =1 Python 2.7.2 Setup completed successfully. | | 51 | ERS |
| Please wait while V | | | |
| Time remaining: 4 seconds | | | |
| | | | |

Figure 21. Python Installation Complete

9. A screen as shown in Figure 22 appears, click the *Next* > button to proceed.



Figure 22. USB2ANY Installation Initialization



Installation Procedure

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10. The *License Agreement* appears, as shown in Figure 23. Read through the agreement carefully and enable the *I Accept the License Agreement* radio button, then press the *Next* > button.

| 🌵 Setup - USB2ANY Runtime 📃 📼 💌 | | |
|--|--|--|
| License Agreement Please read the following important information before continuing. | | |
| Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation. | | |
| Copyright (C) 2010 Texas Instruments Incorporated - <u>http://www.ti.com/</u> Redistribution and use in source and binary forms, with or without | | |
| met: Redistributions of source code must retain the above copyright | | |
| I accept the agreement I do not accept the agreement | | |
| < Back Next > Cancel | | |

Figure 23. USB2ANY License Agreement

11. Set the destination directories for the USB2ANY installation and press the *Next* > button as shown in Figure 24.

| 👋 Setup - USB2ANY Runtime | |
|---|-----------|
| Select Destination Location Where should USB2ANY Runtime be installed? | |
| Setup will install USB2ANY Runtime into the following folder. | |
| To continue, click Next. If you would like to select a different folder, clic | k Browse. |
| C:\Program Files (x86)\TI USB2ANY SDK | Browse |
| At least 11.5 MB of free disk space is required. | |
| | |
| <pre>Back Next ></pre> | Cancel |

Figure 24. USB2ANY Destination Directory



12. The screen shown in Figure 25 appears. Click the Install button to begin the USB2ANY installation.

| setup - USB2ANY Runtime | X |
|---|--------|
| Ready to Install Setup is now ready to begin installing USB2ANY Runtime on your computer. | |
| Click Install to continue with the installation, or click Back if you want to review or change any settings. | |
| Destination location: C:\Program Files (x86)\TI USB2ANY SDK | * |
| 4 | |
| < Back Install (| Cancel |

Figure 25. USB2ANY Start Installation

13. The installer begins self-extraction and proceeds with the installation as shown in Figure 26.

| 👋 Setup - USB2ANY Runtime | |
|---|--------|
| Installing Please wait while Setup installs USB2ANY Runtime on your computer. | |
| Extracting files C:\Program Files (x86)\TI USB2ANY SDK\bin\USB2ANY_SupportInfo.exe | |
| | |
| | |
| | |
| | Cancel |

Figure 26. USB2ANY Installation Progress



14. The USB2ANY Installation Complete window (Figure 27) appears, indicating the completion of the USB2ANY installation. Click the *Finish* button.



Figure 27. USB2ANY Installation Complete

NOTE: The DRV10983/75 GUI requires the LabVIEW Run-Time Engine 2010 to be installed before the GUI is executed.

The DRV10983 and DRV10975 GUI Installer does not include the LabVIEW Run-time-engine. Download the National Instruments LabVIEW Run-Time Engine 2010 from <u>http://www.ni.com/download/labview-run-time-engine-2010-sp1/2292/en/</u>.

The DRV10983 and DRV10975 GUI executable was built in the LabVIEW 2010 (32-Bit) version and expects the LabVIEW Run-Time Engine (32-Bit) version.



A.3 LabVIEW Run-Time-Engine Installation Procedure

The following procedure describes how to install the LabVIEW 2010 Run-Time-Engine.

- 1. Download the LabVIEW 2010 RTE from the link provided earlier.
- 2. Double click on the downloaded LVRTE2010std.exe file. The screen shown in Figure 28 appears. Press the *Next* > button.



Figure 28. LabVIEW RTE Installation Initialization

LabVIEW Run-Time-Engine Installation Procedure

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3. A window as shown in Figure 29 appears. Select the desired features in Run-Time Engine, then click the *Next* > button to continue. TI recommends keeping the default values as provided in the installer.

| 影 NI Enhanced DSC Deployment Support for | LabVIEW 2010 💼 📼 💌 |
|---|--|
| Select Features Please select which features you would like to | o install. |
| Enhanced DSC Deployment Sup | Feature Description: Components to support built applications or shared libraries that use DSC Module features, including programmatic project library and shared variable management. |
| < <u> </u> | This feature will be installed on the local hard drive This feature requires 42MB on your hard drive. |
| | Browse |
| Disk Cost Reset | <pre></pre> |

Figure 29. LabVIEW RTE Select Features

4. The License Agreement appears as shown in Figure 30. Read through the agreement carefully and enable the "I Accept the License Agreement" radio button, then press the *Next* > button.

| 방 NI Enhanced DSC Deployment Support for LabVIEW 2010 | | | |
|---|--|--|--|
| License Agreement You must accept with the license agreement below to proceed. | | | |
| NATIONAL INSTRUMENTS SOFTWARE LICENSE AGREEMENT | | | |
| INSTALLATION NOTICE: THIS IS A CONTRACT. BEFORE YOU SOFTWARE AND/OR COMPLETE THE INSTALLATION PROCE READ THIS AGREEMENT. BY DOWNLOADING THE SOFTWAR THE APPLICABLE BUTTON TO COMPLETE THE INSTALLATIO CONSENT TO THE TERMS OF THIS AGREEMENT AND YOU A BY THIS AGREEMENT. IF YOU DO NOT WISH TO BECOME A P AGREEMENT AND BE BOUND BY ALL OF ITS TERMS AND CO THE APPROPRIATE BUTTON TO CANCEL THE INSTALLATION | DOWNLOAD THE SS, CAREFULLY E AND/OR CLICKING N PROCESS, YOU GREE TO BE BOUND ARTY TO THIS NDITIONS, CLICK N PROCESS, DO NOT | | |
| I accept the license agreement I do not accept the license agreement | nt | | |
| - Back | Next > Cancel | | |

Figure 30. LabVIEW RTE License Agreement



5. The LabVIEW RTE Start Installation window (Figure 31) appears, click the Next > button to begin installation.

| 😸 NI Enhanced DSC Deployment Support for LabVIEW 2010 | |
|--|----------------|
| Ready to Install the Application Click Next to begin installation. | |
| Click the Back button to reenter the installation information or click the wizard. | Cancel to exit |
| | lext > Cancel |

Figure 31. LabVIEW RTE Start Installation

6. The installer begins self-extraction and proceeds with the installation as shown in Figure 32.

| B NI Enhanced DSC Deployment Support for LabVIEW 2010 | |
|--|--------------------------------|
| Updating System The features you selected are currently being installed. | NATIONAL INSTRUMENTS |
| Copying new files | |
| | |
| Time remaining: 0 seconds | |
| | |
| | |
| | |
| | |
| | Cancel |

Figure 32. LabVIEW RTE Installation in Progress



GUI Overview

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7. The LabVIEW RTE Installation Complete window (Figure 33) appears, indicating the completion of the LabVIEW 2010 RTE installation. Click the *Finish* button.

| 岗NI Enhanced DSC Deployment Support for LabVIEW 2010 | |
|--|-------------------------------|
| | |
| | |
| NI Enhanced DSC Deployment Support for LabVIEW 2010 has be successfully installed. Click the Finish button to exit this installation. | en |
| © 2010 National Inst | ruments. All rights reserved. |
| < Back Finis | sh Cancel |

Figure 33. LabVIEW RTE Installation Complete

A.4 GUI Overview

The DRV10983 and DRV10975 GUI was developed to communicate with the part 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 does not explain the configurations of the controls and indicators.

In following sections, DRV10983 GUI images are shown to explain the various features of GUI. The same images apply for DRV10975 devices unless otherwise specified.

A.4.1 Components of the GUI

The device GUI contains four pages:

- Basic Settings
- Advanced Settings
- Display
- About

A.4.1.1 Basic Settings

Figure 34 illustrates the Basic Settings Page of the GUI.

| V DRV10983 EVM GUI | | | |
|------------------------|---|------------------------------------|------------------------------------|
| File Script Debug Help | | | |
| | D | RV10983 EVM GUI | Simulate Communication |
| Selection * | Basic Settings | Advanced Settings | Display |
| | IPD Setting | Before Startup | Manual Refresh |
| ♦ About | Enable IPD 🗹 | Enable Initial Speed Detect 🔽 | Current Limit |
| | IPD Advance Angle 30 deg | Threshold Enable Reverse Drive | Acceleration Current Limit Disable |
| | IPD Clock 95 Hz | Reverse Drive/Brake Threshold | Motor Parameters |
| | IPD Release Mode Tri-state 💌 | Brake Done Threshold No Brake 💌 | Phase Resistance (Ω) 1.23 |
| | Closedloop Setting | Startup Setting | Phase to Phase Kt (mV/Hz) 440 |
| | AdjMode Full cycle adjustment 💌 | AlignTime 0.04 s | |
| | Speed Input Mode PWM Input 💌 | First Order Accelerate 0.9 Hz/s | Enable Configure 🔮 eeRefresh 🔮 |
| | Closed Loop Accelerate 0.045 VCC/s 💌 | Second Order Accelerate 0.66 Hz/s2 | EEPROM Key 🗴 0 😢 🛛 eeWrite 🔮 |
| | Control Coefficient Setting 1 | Threshold 10.4Hz | Motor Configuration |
| | Commutate Control Advance Constant Time 💌 | Open Loop Current rate 0.7 VCC/s | Load Save |
| | T Control Advance (s) 480u 🔮 | Open Loop Current 0.8 A 🔽 | |
| | | CLoopDis 🔲 | |
| Idle | | 1.1.0.0 | CONNECTED 🌵 TEXAS INSTRUMENTS |

Figure 34. Basic Settings Page

A.4.1.1.1 Enable Configure

The controls in the Basic Settings page and Advanced Settings page are only enabled if Enable Configure is selected. Enable Configure specifies the data use between the registers and EEPROM. Click on the control to select the data use. If Enable configure 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.4.1.1.2 Enable IPD

This control enables and disables the controls related to IPD settings. If the 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.4.1.1.3 eeWrite

eeWrite programs to the EEPROM. When this control is clicked, a prompt message asks for confirmation of the voltage level (Figure 35). The eeWrite field is written only if the EEPROM Key is set to B6, and the the power supply voltage level is confirmed.



Figure 35. Confirmation on Voltage Level

A.4.1.1.4 eeRefresh

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

A.4.1.1.5 Manual Refresh

The Manual Refresh Button refreshes the controls of the Motor Parameters, 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.4.1.1.6 Save Motor Configuration

This button saves the current motor configuration into a file that is later loaded into the GUI using the Load option. The button saves the Last Read values for the registers. Perform a Manual Refresh operation before saving the configurations into a file.

A.4.1.1.7 Load Motor Configuration

This button loads the configuration file saved earlier, to bring the device to a known state.



A.4.1.1.8 Help Icon

Move the mouse over the help icon to display a brief description for the control, as shown in Figure 36.



Figure 36. Help Icon

A.4.1.2 Advanced Settings

The Advanced Settings page contains controls to handle the frequency overflow, Buck regulator voltage, Hardware Current Limit, FG motor pole option, and so forth.

| | DRV10 | 983 EVM GUI | ulate Communication |
|-------------|--|---|---------------------|
| Configura | Basic Settings | Advanced Settings | Display |
| ed Settings | Lock Detect | AVS (Anti-voltage Surge) Function | Manual Refresh |
| | Current Limit 📋 No Motor Fault 📋 | Enable Inductive AVS | |
| | Speed Abnormal 📋 Open Loop Stuck 📋 | Enable Mechanical AVS | |
| | BEMF Abnormal 🗌 Closed Loop Stuck 📋 | Mechanical AVS Mode AVS to VCC | |
| | Abnormal Kt lock detect Threshold Kt_high = 3/2Kt. | FG Options | |
| | Lock Detection Current Threshold 0.4 A | | |
| | PWM output Options | FG Open Loop Output Select Output FG in 💌 | |
| | Dead Time Is the second s | FG Cycle Select FG 4pole 💌 | |
| | and LS gate drive | Device Options | |
| | Double the output PWM frequency | Buck Regulator Voltage select 5 V | V |

Figure 37. Advanced Settings



A.4.1.3 Display

The Display page (Figure 38) 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.

| 💠 DRV10983 EVM GUI | | | | | |
|---|--|----------|--------------------|-----------------------------------|---------------------------------|
| File Script Debug Help | | | | | |
| | | DR | V10983 EVM | GUI | Simulate Communication |
| Selection ^ | Basic Settings | | Adva | nced Settings | Display |
| Advanced Settings Advanced Settings Display About | Display | • AU | TO RESH Refresh | Device Status | AUTO REFRESH Refresh |
| | Pole Motor Speed Electrical Period (us) Motor Velocity Constant (mV/Hz) | 1 Hz | 0 rpm | Lock 🥚 Sleep/: OverTemp 🥚 Over | Standby 🥘 Current 🥘 |
| | IPD Position (degree) Supply voltage (V) | NaN 0 | | Speed Control | Manual Refresh |
| | Speed Command (%) Speed Cmd Buffer (%) | 0 | | Disable the Sleep/Standby Mode | e [] de [] |
| | Fault Code | 0 1 2 | 3 4 5 | Speed | 0 🤮 Stop |
| Idle | | | | 1.0.0.4 | connected 🛛 🐺 Texas Instruments |

Figure 38. Display

A.4.1.3.1 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.4.1.3.2 Pole

This control calculates the RPM in the Display section, given by the formula:

• If motor speed (Hz) ≥ 2, motor speed (rpm) = (1000000/electrical period(us)) × 120/pole. Else, motor speed (rpm) = motor speed (Hz) × 120/pole. The default value of this control is 1.

A.4.1.3.3 Stop

This control writes the speed control with a value of 0.

A.4.1.3.4 About

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



Figure 39. About Page

A.4.2 Menu Options

A.4.2.1 File

The File menu contains the Exit option as shown in Figure 40. The Exit option stops the execution of the DRV10983 and DRV10975 GUI.



Figure 40. File Menu

A.4.2.2 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 DRV10983 and DRV10975 GUI, the scripting is done using Python.

GUI Overview

A.4.2.2.1 Recording and Running Scripts

1. Start recording by going to Scripts \rightarrow Launch Window in the DRV10983 and DRV10975 GUI.

| ch Window | | RV10983 FVM GUI | Simulate Communication |
|----------------------------------|---|---|----------------------------------|
| Recording Recording | Basic Settings | Advanced Settings | Display |
| Contigura tings d Settings | IPD Setting | Before Startup | Manual Refresh |
| | Enable IPD | Enable Initial Speed Detect 🖌 | Current Limit |
| | IPD Current Threshold (A) No IPD function | Initial Speed Detect Threshold 6 Hz (80ms no | Acceleration Current Limit 2.0 A |
| | IPD Advance Angle 30 deg 💌 | Enable Reverse Drive | |
| | IPD Clock 24 Hz | Reverse Drive/Brake Threshold 6.3 Hz | Motor Parameters |
| | IPD Release Mode Brake 💌 | Brake Done Threshold No Brake | |
| | Closedloop Setting | Startup Setting | Phase Resistance (Ω) 1.23 |
| | AdjMode Full cycle 💌 | AlignTime 0.08 s | Phase to Phase Kt (mV/Hz) 55 |
| | Speed Input Mode Analog Input | First Order Accelerate 9.2 Hz/s | Enable Configure 🔮 eeRefree |
| | Closed Loop Accelerate 0.37 VCC/s 💌 | Second Order Accelerate 6.9 Hz/s2 💌 | |
| | Control Coefficient Setting 1 | Open to Closed Loop Threshold 25.6Hz | EEPROM Key x 0 Configuration |
| | Commutate Control Advance Constant Time 💌 | Open Loop Current rate 1.5 VCC/s 💌 | Load Save |
| | T Control Advance (s) 220u 🔮 | Open Loop Current 0.4 A | |
| | | CLoopDis 🔲 | |

Figure 41. Script Menu

2. This opens an untitled, empty Python window in IDLE IDE.



Figure 42. Launch Macro



- 3. Once the python window launches, the Start Recording option is enabled in the same Script menu, in the GUI window. Selecting the Launch Window again opens another untitled window, and the last opened window is active.
- 4. In the GUI window, traverse to the Scripts \rightarrow Start Recording option in the menu.

All actions performed on the GUI are recorded in the Python window. The recording function is indicated by the window blinking in green, while the window is recording as shown in Figure 43.

| N D | 76 *Untitled* | _ _ X | 1 | |
|------|--|--------------|------------------|---|
| File | File Edit Format Run Options Windows Help GUI_Module=import('DRV10983-75') | <u>^</u> | N GUI | Simulate Communication |
| Sele | <pre>GUI=GUI_Module.Device_GUI("DRV10983-75.exe") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "Sysopt4") GUI.read_register("DRV10983", "Sysopt2") GUI.read_register("DRV10983", "Sysopt2") GUI.read_register("DRV10983", "Sysopt4") GUI.read_register("DRV10983", "Sysopt4") GUI.read_register("DRV10983", "Sysopt9") GUI.read_register("DRV10983", "Sysopt9") GUI.read_register("DRV10983", "Sysopt1") GUI.read_register("DRV10983", "Sysopt1") GUI.read_register("DRV10983", "Sysopt1") GUI.read_register("DRV10983", "Sysopt1") GUI.read_register("DRV10983", "Sysopt1") GUI.read_register("DRV10983", "Sysopt2") GUI.read_register("DRV10983", "Sysopt2") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "Sysopt3") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "Sysopt6") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "Sysopt6") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "MotorParam3") GUI.read_register("DRV10983", "MotorParam3")</pre> | | ivanced Settings | Display Manual Refresh Current Limit Acceleration Current Limit 2.0 A Motor Parameters Phase Resistance (Ω) 1.23 Phase to Phase Kt (mV/Hz) 55 Enable Configure eeRefresh Motor Configuration Load Save |
| Idle | GUI.read_register("DRV10983","MotorParam2") GUI.read_register("DRV10983","EECtrl") | Ln: 1 Col: 0 | Dis | CONNECTED 🌵 TEXAS INSTRUMENTS |

Figure 43. Start Recording

The Python window captures predefined actions only. While recording, no action such as moving the cursor or entering data has to be performed on the Python window.

1. Stop Recording. To stop recording, traverse to the Scripts \rightarrow Stop Recording option in the GUI window menu.



GUI Overview

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2. The Launch Window remains after the recording has been stopped, as shown in Figure 44. It can be closed with or without saving.



Figure 44. Stop Recording

3. While saving, the window must be saved with extension .py under the script folder.



4. Run Script. To run the script, in the IDLE IDE menu bar, go to Run → Run Module as shown in Figure 45.



Figure 45. Run Macro

- 5. The script runs and displays the message "Script completed successfully" in the Python window.
- To run an already saved script, go to File → Open in the IDLE IDE window, and choose the file from the browser.



A.4.2.2.2 Debug

The Debug option is used for the following operations:

- **Simulation** By selecting the simulation submenu, the GUI runs in simulation mode. By unselecting it, the GUI runs in connected mode.
- File Logging The log to file submenu logs the GUI activities to a specified log file.
- **Debugging** The Debug log option logs all user activities. If not selected, only the high-level operations are logged.

| 🗢 DRV10983 EVM GUI | | | |
|---|---|--|--|
| File Script Debug Help | | | |
| Simulation Debug Log | D | RV10983 EVM GUI | Simulate Communication |
| Selection Log to File | Basic Settings | Advanced Settings | Display |
| Advanced Settings Advanced Settings Oisnlav | IPD Setting | Before Startup | Manual Refresh |
| ♦ Ahnut | Enable IPD IPD Current Threshold (A) No IPD function IPD Advance Angle 30 deg | Enable Initial Speed Detect Initial Speed Detect Threshold Enable Reverse Drive | Current Limit Acceleration Current Limit No Software |
| | IPD Clock 12 Hz IPD Release Mode Brake | Reverse Drive/Brake Threshold 6.3 Hz Brake Done Threshold No Brake | Motor Parameters |
| | Closedloop Setting | Startup Setting | Phase to Phase Kt (mV/Hz) 0 |
| | AdjMode Full cycle Speed Input Mode Analog Input Closed Loop Accelerate Inf fast Control Coefficient Setting 0.25 Commutate Control Advance Constant Time Mode | AlignTime 5.3 s First Order Accelerate 76 Hz/s Second Order Accelerate 57 Hz/s2 Open to Closed Loop Threshold Not Applicable Open Loop Current rate 6 VCC/s Open Loop Current 0.2 A | Enable Configure @ eeRefresh @ EEPROM Key x 0 @ eeWrite @ Motor Configuration Load Save |
| - | | CLoopDis | |

Figure 46. Debug Menu



GUI to DRV10983 and DRV10975 Register Cross Reference

The DRV10983 and DRV10975 register names and GUI names do not always match. Table 2 provides a cross reference between the two. The Tab and Section location of the register values in the GUI is also provided.

| Registers | | | | GUI | | | | |
|------------------|-----|---------------------|---------|-----------------------|---------------------------------|--|--|--|
| Register Name Ad | ddr | Register Map | Tab | Section | GUI Name | | | |
| SpeedCtrl1 0x | x00 | SpdCtrl[7:0] | Display | Speed control | Speed | | | |
| SpeedCtrl2 0x | x01 | OverRide | Display | Speed control | OverRide | | | |
| | | SpdCtrl[8] | Display | Speed control | Speed | | | |
| DevCtrl 0x | x02 | enProgKey[7:0] | Basic | Motor parameters | EEPROM KEY | | | |
| EECtrl 0x | x03 | sleepDis | Display | Speed control | Disable Sleep/Standby mode | | | |
| | | SIdata | Basic | Motor parameters | Enable Configure | | | |
| | | eeRefresh | Basic | Motor parameters | eeRefresh | | | |
| | | eeWrite | Basic | Motor parameters | eeWrite | | | |
| Status 0x | x10 | OverTemp | Display | Device status | OverTemp | | | |
| | | Slp_Stdby | Display | Device status | Sleep/Standby | | | |
| | | OverCurr | Display | Device status | Overcurrent | | | |
| | | MtrLck | Display | Device status | Lock | | | |
| MotorSpeed1 0x | x11 | MotorSpeed[15:8] | Display | Display | Motor speed (rpm) | | | |
| MotorSpeed2 0x | x12 | MotorSpeed[7:0] | Display | Display | Motor speed (rpm) | | | |
| MotorPeriod1 0x | x13 | MotorPeriod[15:8] | Display | Display | Electrical period (µs) | | | |
| MotorPeriod2 0x | x14 | MotorPeriod[7:0] | Display | Display | Electrical period (µs) | | | |
| MotorKt1 0x | x15 | MotorKt[15:8] | Display | Display | Motor velocity constant (mV/Hz) | | | |
| MotorKt2 0x | x16 | MotorKt[7:0] | Display | Display | Motor velocity constant (mV/Hz) | | | |
| IPDPosition 0x | x19 | IPDPosition[7:0] | Display | Display | IPD position (degree) | | | |
| SupplyVoltage 0x | x1A | SupplyVoltage [7:0] | Display | Display | Supply voltage (V) | | | |
| SpeedCmd 0x | x1B | SpeedCmd [7:0] | Display | Display | Speed command (%) | | | |
| spdCmdBuffer 0x | x1C | spdCmdBuffer[7:0] | Display | Display | Speed cmd buffer (%) | | | |
| FaultCode 0x | x1E | Lock5 | Display | Display | Fault code 5 | | | |
| | | Lock4 | Display | Display | Fault code 4 | | | |
| | | Fault3 | Display | Display | Fault code 3 | | | |
| | | Lock2 | Display | Display | Fault code 2 | | | |
| | | Lock1 | Display | Display | Fault code 1 | | | |
| | | Lock0 | Display | Display | Fault code 0 | | | |
| MotorParam1 0x | x20 | DoubleFreq | Advand | ed PWM output options | Double the output PWM frequency | | | |
| | | Rm[6:0] | Basic | Motor parameters | Phase resistance (Ohms) | | | |
| MotorParam2 0x | x21 | AdjMode | Basic | Closedloop setting | AdjMode | | | |
| | | Kt[6:0] | Basic | Motor parameters | Phase to phase Kt (mV/Hz) | | | |
| MotorParam3 0x | x22 | CtrlAdvMd | Basic | Closedloop setting | Commutate control advance mode | | | |
| | | TCtrlAdv[6:0] | Basic | Closedloop setting | T control advance (s) | | | |
| SysOpt1 0x | x23 | ISDThr[1:0] | Basic | Before startup | Initial speed detect threshold | | | |
| 1 | 1 | | | | | | | |

Table 2. GUI to DRV10983 and DRV10975 Register Cross Reference

SLOU393C–July 2014–Revised January 2015 Submit Documentation Feedback GUI to DRV10983 and DRV10975 Register Cross Reference 41



| Registers | | | | GUI | |
|---------------|------|------------------|----------|-----------------------------------|--|
| Register Name | Addr | Register Map | Tab | Section | GUI Name |
| | | ISDen | Basic | Before startup | Enable initial speed detect |
| | | RvsDrEn | Basic | Before startup | Enable reverse drive |
| | | RvsDrThr[1:0] | Basic | Before startup | Reverse drive/brake threshold |
| SysOpt2 | 0x24 | OpenLCurr[1:0] | Basic | Startup setting | Open loop current |
| | | OpLCurrRt[2:0] | Basic | Startup setting | Open loop current rate |
| | | BrkDoneThr[2:0] | Basic | Before startup | Brake done threshold |
| SysOpt3 | 0x25 | CtrlCoef[1:0] | Basic | Closedloop setting | Control coeffiecient setting |
| | | StAccel2[2:0] | Basic | Startup setting | Second order accelerate |
| | | StAccel[2:0] | Basic | Startup setting | First order accelerate |
| SysOpt4 | 0x26 | Op2ClsThr[4:0] | Basic | Startup setting | Open to closed loop threshold |
| | | AlignTime[2:0] | Basic | Startup setting | Align time |
| SysOpt5 | 0x27 | LockEn[3] | Advanced | Lock detect | No motor fault |
| | | LockEn[2] | Advanced | Lock detect | BEMF abnormal |
| | | LockEn[1] | Advanced | Lock detect | Speed abnormal |
| | | LockEn[0] | Advanced | Lock detect | Current limit |
| | | 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 |
| SysOpt6 | 0x28 | SWiLimitThr[3:0] | Basic | Current limit | Acceleration Current Limit |
| | | HWiLimitThr[2:0] | Advanced | Current limit | Lock Detection Current Threshold |
| SysOpt7 | 0x29 | LockEn5 | Advanced | Lock detect | Closed loop stuck |
| | | ClsLpAccel[2:0] | Basic | Closedloop setting | Closed loop accelerate |
| | | Deadtime[3:0] | Advanced | PWM output options | Dead time between HS and LS gate drive |
| SysOpt8 | 0x2A | IPDCurrThr[3:0] | Basic | IPD setting | IPD current threshold |
| | | LockEn4 | Advanced | Lock detect | Open loop stuck |
| | | VregSel | Advanced | Device options | Buck regulator voltage select |
| | | IPDClk[1:0] | Basic | IPD setting | IPD clock |
| SysOpt9 | 0x2B | FGOLSet[1:0] | Advance | FG options | FG open loop output select |
| | | FGcycle[1:0] | Advance | FG options | FG cycle select |
| | | KtLckThr[1:0] | Advance | Lock detect | Abnormal Kt lock detect threshold |
| | | SpdCtrlMd | Basic | Closedloop setting | Speed input mode |
| | | CLoopDis | Basic | Startup setting | CLoopDis |

Table 2. GUI to DRV10983 and DRV10975 Register Cross Reference (continued)

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Revision A History

Changes from Original (July 2014) to A Revision

- Changed TelcoMotion DT4260-24-055--4H-TI to Runtian ZWL12_22_2.5A in the DRV10983 EVM Kit Contents list 3
- Added EVM motor images.
- Changed TelcoMotion DT4260-24-055--4H-TI to Runtian ZWL12_22_2.5A in the DRV10983 Bill of Materials list...... 18
- Changed GUI Start Installation image in the Installation Procedure section.
 Changed GUI content in SysOpt6 row of the GUI to DRV10983 Register Cross Reference table.
 42

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

Revision B History

Changes from A Revision (October 2014) to B Revision

| • | Added DRV10975 throughout the guide. Changed all mentions of DRV10983 EVM to DRV109xx family | . 1 |
|---|--|-----|
| • | Added Initial GUI Screen image | 11 |
| • | Added GUI in Simulation Mode image | 12 |
| • | Added Disable Sleep Mode image | 14 |
| • | Added Power-on Sequence and Connection With User Specific Motor section | 16 |
| • | Changed U1 PartNumber | 18 |
| | | |

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

Revision C History

Changes from B Revision (January 2015) to C Revision

| • | Changed all DRV109xx uses to DRV10983 and DRV10975 | 1 |
|---|---|----|
| • | Changed power supply rail voltage from "8 to 26 V" to "8 to 28 V" | 4 |
| • | Changed first image under Section 4.2.3 | 7 |
| • | Deleted first five steps from previous revision, Added first five steps from Section 6 in previous revision | 10 |
| • | Changed voltage limit for DRV10983 EVMs from 26 V to 28 V | 10 |
| • | Changed Step 9 | 14 |
| • | Deleted Steps 6 and 7 and Figure 13 from previous revision | 16 |
| • | Deleted "Trimmed" register map from "Status" row | 41 |
| | | |

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



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Page

43

Revision History

Page

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