EVM User's Guide: DRV3901-Q1

DRV3901-Q1EVM User's Guide

ABSTRACT

This document is the user's manual for the DRV3901-Q1 evaluation module (EVM) and the GUI to control the EVM. The DRV3901 is a fully integrated device for driving a pyro-fuse initiator in a 12V automotive system. The EVM showcases two DRV3901-Q1 devices for flexibility in testing parallel or redundant systems. The device supports an input voltage up to 28V and runs on a logic supply voltage of 5.0V.

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Trademarks

1 Introduction

WARNING

The evaluation module (EVM) has a fuse rated for 20 A. Please confirm that the maximum current draw of the battery voltage supply is always less than 20 A to prevent the fuse from activating.

The DRV3901-Q1 is a fully integrated device for driving a pyro-fuse initiator in a 12-V automotive system. The DRV3901-Q1 has multiple-diagnostic and protection features (over-current protection, over-temperature shutdown, under voltage, and more) that protect the IC and check the availability of the deployment function.

2 Hardware Overview

The following sections explain the main components of the EVM (including connectors, configuration headers, and signal test points) in detail. Information such as voltage and current ratings is also present to state the limitations of the hardware to prevent potential damage to the board and its components. Figure 2-1 shows the main components of the DRV3901-Q1EVM. Table 2-1 gives a detailed description of each of the marked components. Both Figure 2-1 and Table 2-1 are referenced in the following sections.

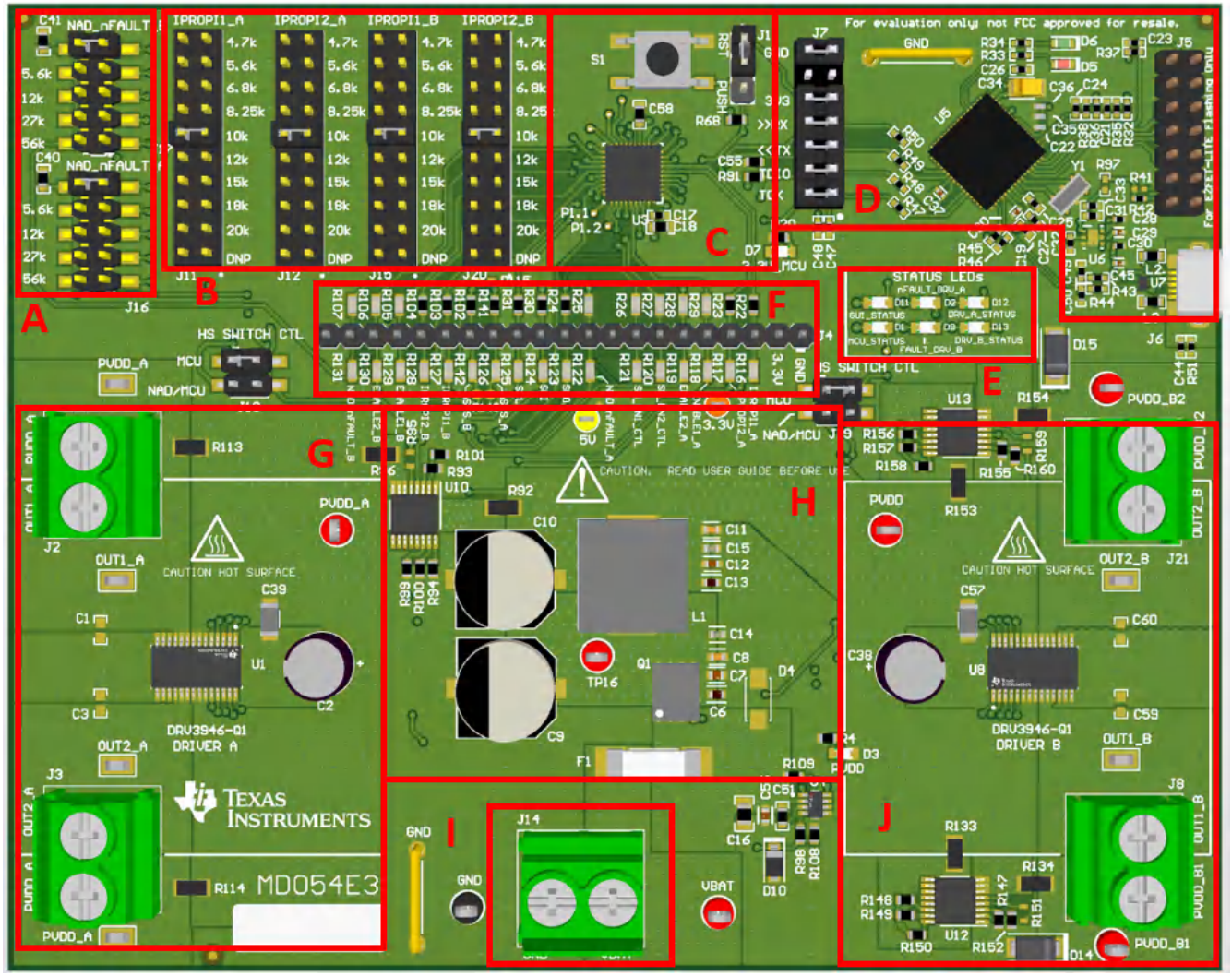

Figure 2-1. DRV3901-Q1EVM Hardware Components

Table 2-1. DRV3901-Q1EVM Detailed Description of Components

Component	Description
A	J3: NAD_nFAULT resistor for Driver A J8: NAD_nFAULT resistor for Driver B
B	STATUS LEDs. Refer to Table 2-4
C	J1: S1 button function selection header. Default position set to RST. PUSH function is not supported by firmware but firmware can be modified to perform any desired task when button is pressed and shunt is placed in PUSH position S1: MCU Reset/Push function button. Only MCU Reset function is supported. Press the button to reset MCU when J1 is in RST position.

Table 2-1. DRV3901-Q1EVM Detailed Description of Components (continued)

Component	Description
D	J7: Header for serial communication signals (RX, TX) and TDIO or TCK for programming main MCU (U5). Shunts are required for communication between main MCU (U5) and ezFET-LITE debugger. J5: EZFET-LITE flashing connector. Header should be left disconnected. J6: USB connector
E	Main signal header. Refer to Table 2-3
F	U1: DRV3901-Q1 Driver A P1: Driver A VREG and PVDD shunt jumper. P3: Driver A VREG and VDRV shunt jumper.
G	Reverse battery protection, fuse, and EMI filter circuit
H	Main power supply (VBAT) connector
I	U8: DRV3901-Q1 Driver A P2: Driver A VREG and PVDD shunt jumper. P4: Driver A VREG and VDRV shunt jumper.

2.1 Connectors and Configuration Headers

The main power connector J14 (I) is where the VBAT supply is connected. The maximum current the connector can withstand before any damage or malfunction occurs is 20 A. Confirm that the supply current does not exceed this value to prevent potential damage to the board. There is an included 20-A fuse that should protect the board in case the current does exceed 20 A, but protection should not solely rely on the fuse. TI recommends limiting the supply current to below 20 A to further protect the board.

The output connectors J2, J21 are the same as the main power connector.

The NAD_FAULT_x headers select the NAD_FAULT resistor values. By default, 5.6 kΩ and 56 kΩ are chosen for driver A and B respectively. Please read the data sheet for more information on the NAD_FAULT resistors and their function. Table 2-2 lists the available NAD_FAULT resistor values for each header.

Table 2-2. NAD_FAULT resistor selector header values

Header Pins	Resistor value to GND
1-2	5.6 kΩ
3-4	12 kΩ
5-6	27 kΩ
7-8	56 kΩ

2.2 Signal Test Points

Table 2-3 describes each MCU signal on header J4. There are two rows of header pins on each side. Normally need to keep shunts for all signals on J4 and P5/P6. Then MCU can communicate with DRV3901-Q1 driver with accessible SPI. Accessible SPI is default configuration for GUI.

Removing shunts on J4 disconnects the signal from the MCU. This allows the drivers to be controlled with an external controller.

Changing P5 and P6 configuration is used to change nSCS signal connection between. I case not to use accessible SPI but normal SPI, P5/P6 can set nSCS as normal SPI configuration

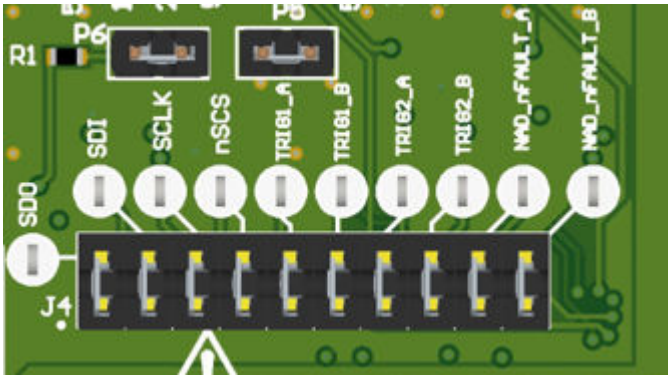

Figure 2-2. J4 MCU Signal Header

Table 2-3. MCU signal header

Signal	Description
SDI	SDI signal
SDO	SDO signal
SCLK	SCLK signal
nSCS	nSCS signal for Driver A and B
TRIG1_A	HW pin trigger 1 for Driver A
TRG1_B	HW pin trigger 1 for Driver B
TRIG2_A	HW pin trigger 2 for Driver A
TRIG2_B	HW pin trigger 2 for Driver B
NAD_nFAULT_A	nFAULT signal for Driver A
NAD_nFAULT_B	nFAULT signal for Driver B

2.3 LED Indicators

LED indicators on the EVM provide various visual indicators.Figure 2-3 highlights all of the LEDs in the DRV3901-Q1EVM, and Table 2-4 briefly describes each LED.

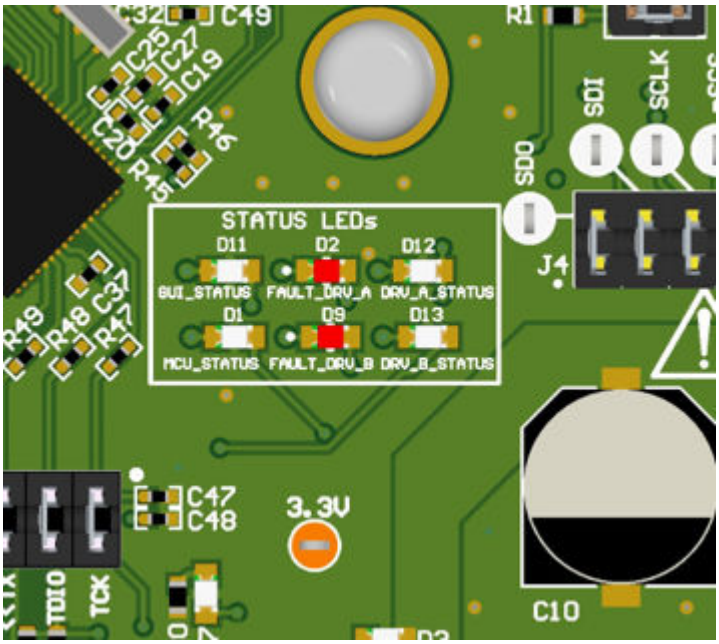

Figure 2-3. LED Indicators

Table 2-4. Description of LEDs

LED	Description
D3	PVDD supply indicator
D5	EZFET-LITE flashing indicator : Flashes while the EVM is being programmed
D6	Blinks when EVM USB connects successfully to the computer
D7	Blinks ON or OFF at a rate of ≅1 second when the MCU is active and indicates that the EVM is programmed
D1	Blinks rapidly ON/OFF when the the EVM successfully connects to the GUI
D11	When EVM and GUI connection is established
D9	Driver B fault indicator: Turns ON when a fault is detected
D2	Driver A fault indicator: Turns ON when a fault is detected

3 EVM GUI Control Application

The GUI application is written with Texas Instruments' GUI Composer, and can be run directly from a Chrome-based web browser, or installed onto your computer. Because GUI Composer apps are written with a NodeJS back end, the GUI application is cross-platform compatible by design. This document will only cover installation on a PC for sake of brevity, but Mac and Linux users can find installers in the GUI Composer Gallery.

3.1 MSP430 FET Drivers

The MSP430 FET Drivers are required for the operating system to properly enumerate the JTAG and UART ports created by the EZFET_LITE. The latest drivers can be found here MSP430 FET Drivers:

Download the driver package corresponding to your operating system, extract the archive, and run the installer.

In Windows, two new ports are enumerated when the EVM is connected as shown in Figure 3-1

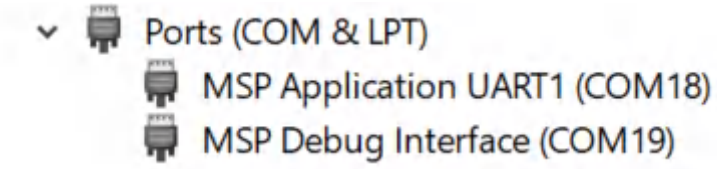

Figure 3-1. MSP430 EZFET_LITE enumerated USB ports

Successful installation shows Texas Instruments as the driver publisher (Figure 3-2)

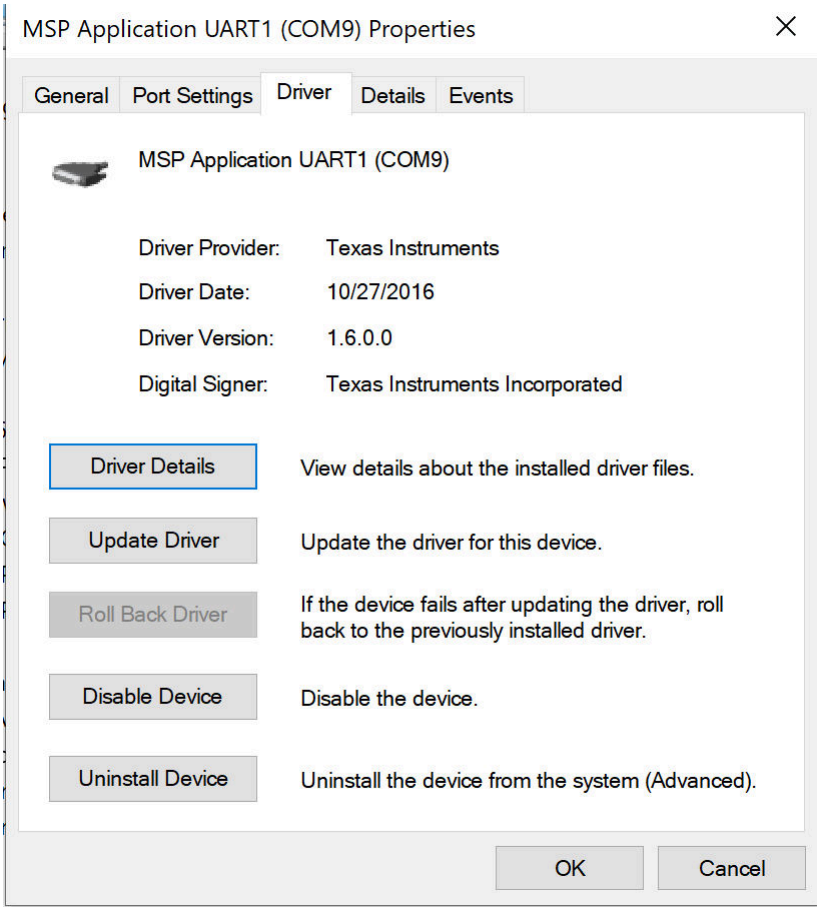

Figure 3-2. MSP Application UART Driver Properties

3.2 Cloud-based GUI

To launch the GUI application from a Chrome-based browser.

1. Navigate to DRV3901-Q1 EVM-GUI.
2. When presented with the list of available GUIs, launch the latest version by clicking in the tile anywhere that is not related to an icon for downloading the installer or GUI Composer.

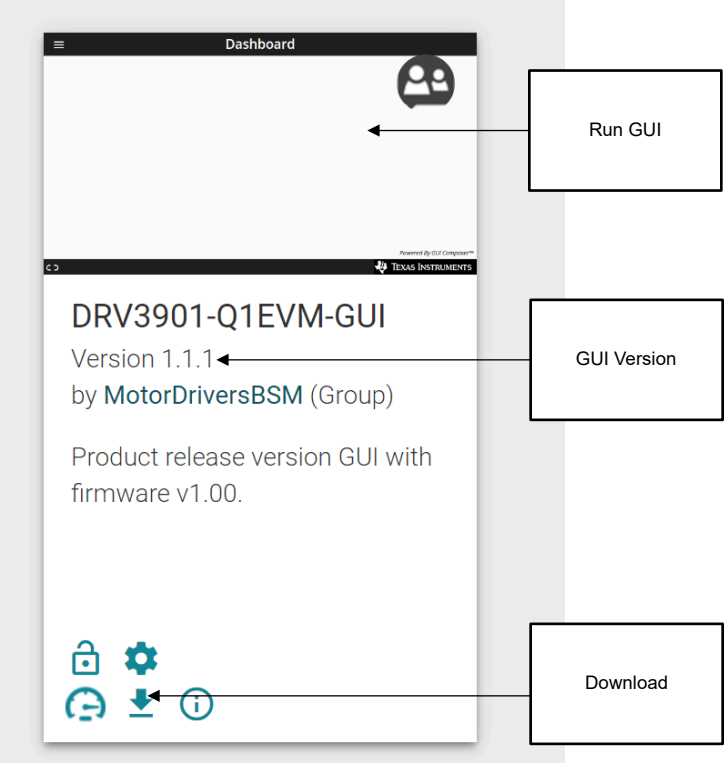

Figure 3-3. Cloud GUI

Hardware setup and operation of the GUI is the same as the desktop version and is consolidated in the following EVM GUI Operation section.

3.3 Local Installation

Follow these instructions for downloading and installing the latest version of the EVM GUI application:

1. The EVM GUI application installer can be downloaded from the TI GUI Composer Gallery, DRV3901-Q1 EVM-GUI
2. From the gallery, click the icon in the latest version and select the installer for the operating system (Windows, Linux or Mac). Refer back to the previous section for a visual depiction of the Gallery page.
3. Decompress the .zip file.
4. From the decompressed archive, run the installer DRV3901-Q1EVM-GUI-x.y.z.setup-win.exe. If the GUI Composer Runtime is not installed on the PC, the installer will automatically start the process. The installer contents will look slightly different for each OS.
5. You are ready to run the GUI in your machine after completing the hardware setup in the next section.

4 EVM GUI Operation

4.1 Hardware Set-up

Follow these steps to setup the EVM prior to launching the GUI:

1. It is advised to make any jumper configuration changes prior to powering the EVM. The NAD_nFAULT_x headers should be selected as desired prior to powering up the board.
2. Connect micro-USB cable to J6 (Figure 2-1). For proper GUI application operation, it is important to connect the EVM USB cable to a computer prior to applying VSUP power to the EVM. For standalone EVM testing a USB connection is not necessary.
3. With the VSUP external supply outputs disabled, connect +BAT supply to the screw terminals on the EVM (J14), observing polarity (Figure 2-1).
4. Energize the VSUP supply. PVDD LED D3 and 3.3V_MCU LED D7 will illuminate. If PVDD LED does not illuminate, verify polarity and check fuse(s) are installed and have continuity.
5. After applying VSUP supply, LED D6 illuminates to indicate that there is a successful USB connection with the computer. If LED D6 is NOT ON, disconnect USB cable from computer, turn-off power supply, re-connect USB to computer, and turn-on the supply.
6. The EVM is ready to be used with the GUI application (Section 4.2). In certain situations, such as while disconnecting and reconnecting VM power before the power supply capacitors are fully discharged a proper firmware reset may not happen. If the Status LED (D1) is not blinking as expected, press the reset push button once with jumper J1 installed in the RST position. Do not unplug the USB cable while the VM power is active. If you do, switch off the VM power, wait until it is fully discharged and proceed to step 2.
7. The latest version of the GUI application is bundled with the latest version of the EVM firmware. It is recommended to do a firmware update before selecting and connecting to an EVM variant using the GUI application.

4.2 Launching the DRV3901-Q1EVM GUI Application

The instructions below apply to both the desktop and web versions of the GUI. These instructions assume that the hardware setup steps in the previous section are already completed.

1. Launch the GUI application.
2. From the screen reference in Figure 4-1,click on the icon to the right labeled "DRV3901-Q1EVM".

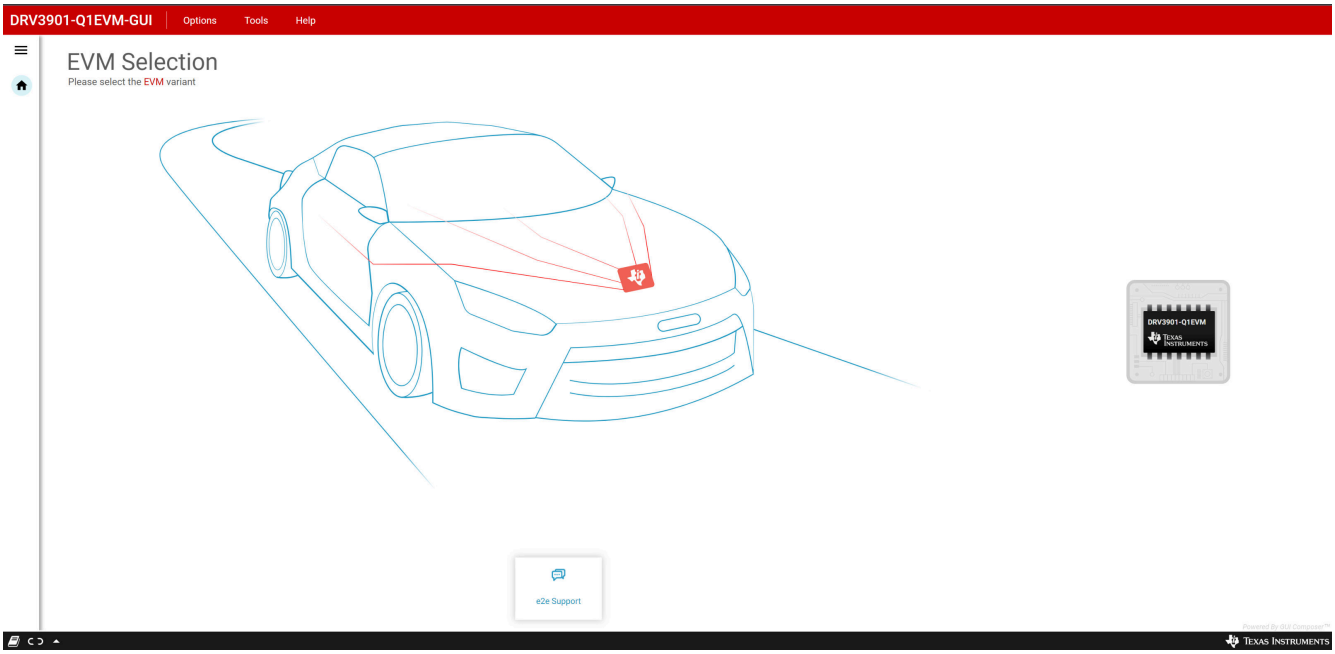

Figure 4-1. GUI Startup Page

3. After clicking the icon, the GUI application will initiate communications with the EVM. Connection confirmation will be displayed as shown below in Figure 4-2. The EVM should now be connected. The

GUI_STATUS LED (D11) should now be blinking to confirm that there is a successful GUI connection. Please do not proceed to use the GUI app is the D11 is not blinking.

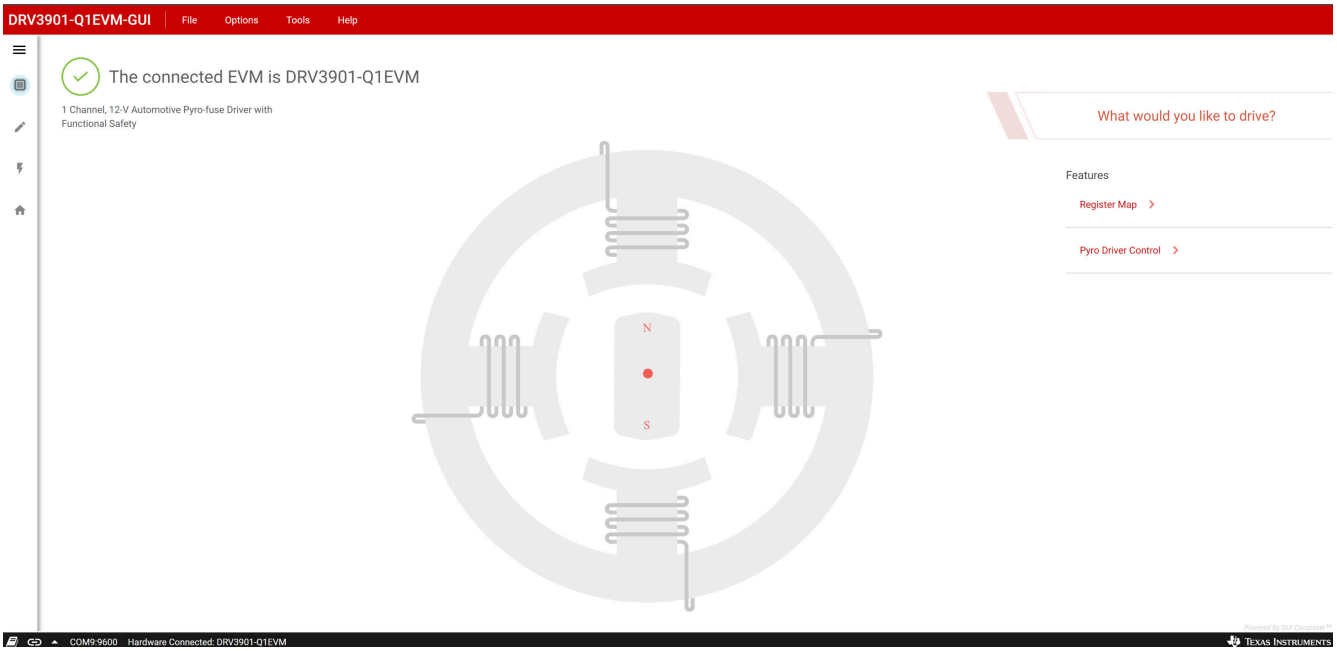

Figure 4-2. GUI Connected Page

4. At this point, the user may set-up the EVM for device evaluation:
   - Register Map page for read/write access of register bit fields.
   - Control page with configuration and diagnostic options.
   - GUI Home page

5 GUI Overview

Figure 5-1 shows the motor control page of the GUI application. The main sections of the control page are labeled A through S. Figure 5-2 describes every labeled section. Before attempting to use the GUI, read the data sheet to learn more about the register map and the different configuration parameters for this driver.

Note

The "FAULT DRIVER A", "FAULT DRIVER B" and “WARNINGS” fault indicators and the corresponding fault LEDs in the EVM will be red during initial power up and GUI connection. The reason is due to the DRV3901- Q1 detecting the SPI watchdog (SPI_WD_DIS) which is enabled by default. To clear the fault, reset SPI_WD_DIS for both Driver A and Driver B. Then CLR_FLT. Read the datasheet for learning about the fault reporting of the DRV3901-Q1.

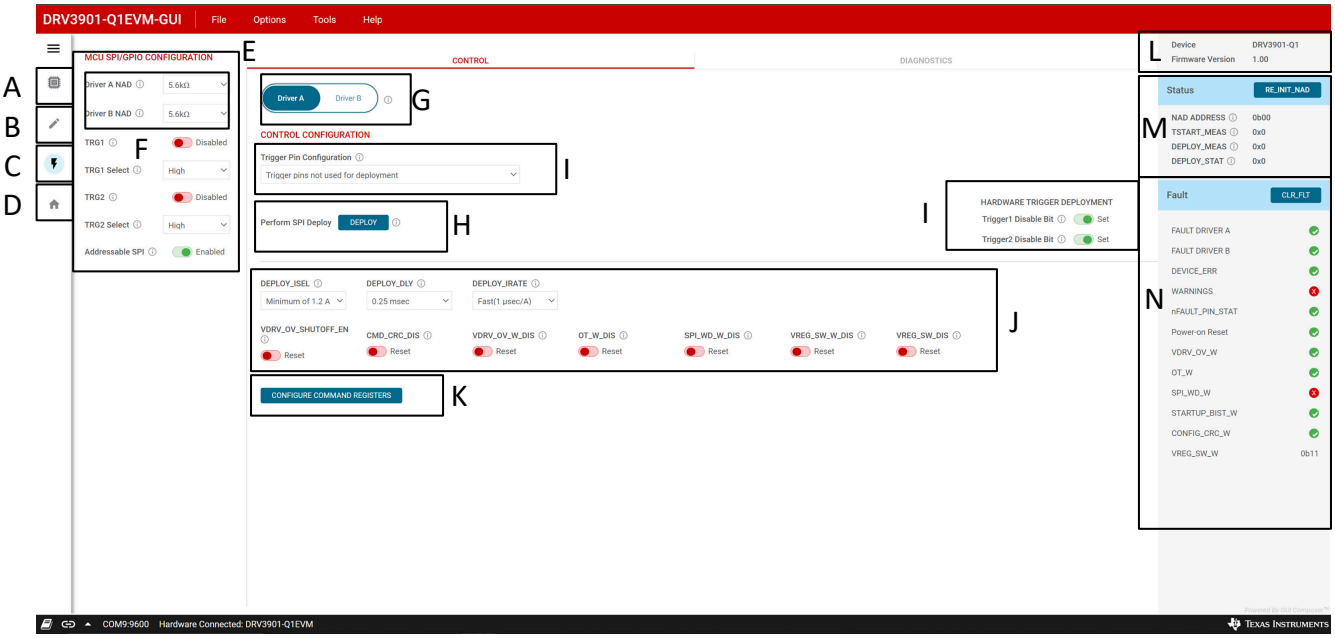

Figure 5-1. GUI Control Page Overview

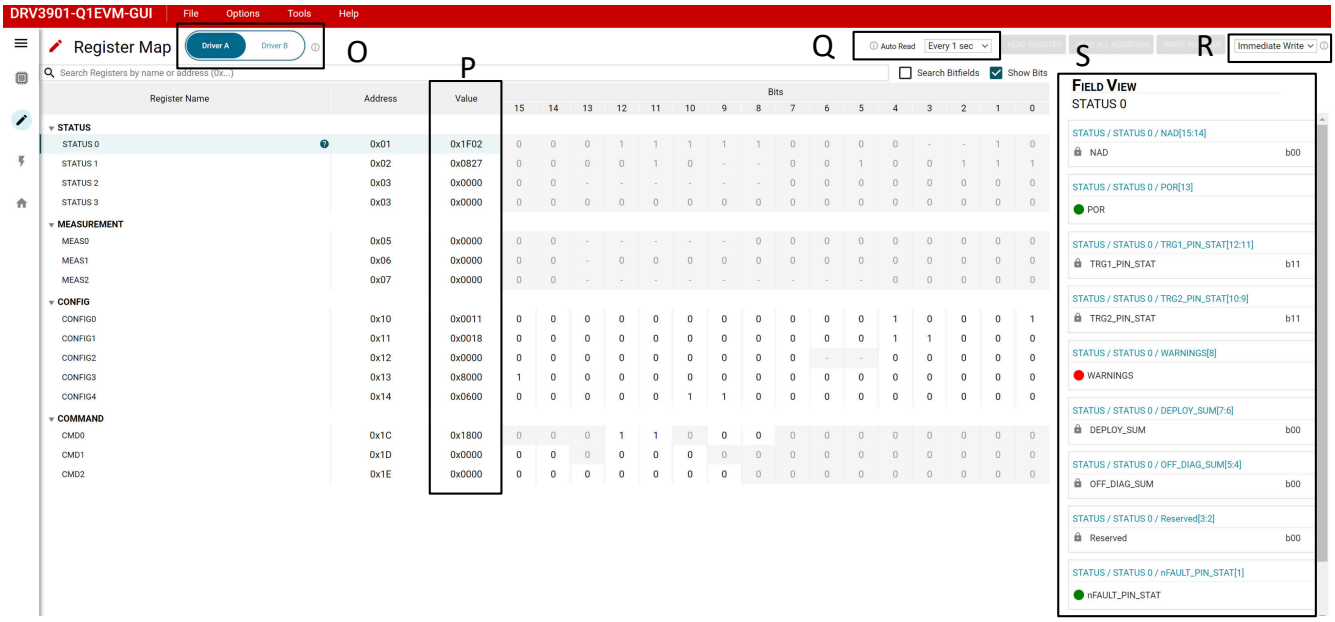

Figure 5-2. Regmap Overview

Table 5-1. DRV3901-Q1EVM GUI Description

Section	Description
A	Main GUI start-up page
B	Register map page. Device registers can be read/written to configure device. All of the configurations can be done in the register map if desired.
C	Pyro control page. Most of the basic configurations can be done in this page. For more advanced configurations, the register map should be used.
D	Home page.
E	Configuration related to MCU on EVM. Including TRGx output signal selection to driver ICs. TRGx is used for Hardware deployment.
F	NAD resistor settings. Click the NAD Setting button to switch between Driver A and Driver B and select the NAD resistor from the nFAULT/NAD resistor drop-down menu. The resistor for each Driver needs to match the selected resistor in J3 and J8 Table 2-2 .
G	Select between controlling driver A or B. In Standalone SPI, only the selected driver will be active. In Addressable SPI, both drivers are active and only the selected driver can be configured. Refer to Section 6.
H	SPI deployment execution button.
I	Hardware trigger deployment related controls.
J	Control configurations. Extracted some items from register map.
K	Command register button. Pop up window comes up.
L	Connected device name and Firmware version.
M	STATUS register information.
N	Fault summary table. FAULT DRIVER A and FAULT DRIVER B mirror the NAD/nFAULT pins of each driver respectively. When NAD/nFAULT is LOW, indicating a fault, the corresponding status indicator will turn RED. The remaining fault indicators are for common warnings. Click the "CLEAR" button to clear a fault. Refer to the register map to view all the faults and warnings in the STATUS registers.
O	Device Selector widget. Same as widget F. Register values shown in the register map correspond to the selected driver. Please note that if the drivers are reset from a power cycle, the register values will go back to their default values.
P	Register value column. Write desired value to write to the registers.
Q	Frequency at which GUI reads all of the registers and display updated values in the register map. Default value is 1 second. If Auto Read function is not desired, it can be set to "NONE". Doing so will activate the "READ REGISTER" and "READ ALL REGISTER" buttons. "READ REGISTER" will only read the selected register. "READ ALL REGISTERS" will read all registers.
R	"Immediate Write" will write to the register as soon as the value is entered. "Deferred Write" will only write to register after value has been entered and "WRITE REGISTER" button is clicked.
S	Bit field view of selected register.

5.1 Programming the EVM

It is recommended to do a firmware update in the case that the EVM is not connecting to the GUI after multiple attempts. A pop-up message will appear when firmware is out of date. The following steps describe how to update the firmware of the EVM using the GUI:

1. Connect EVM to GUI following instructions in Section 4.1.
2. Open the GUI and click on the "DRV3901-Q1EVM" icon on the right side of the main start-up page. The GUI will attempt to connect to the EVM but may fail. Please be patient and wait until either the GUI says the EVM was not connected successfully or it was connected.
3. Click on File -> Program Device to begin programming the EVM (see Figure 5-3). A pop-up small window will appear showing the firmware flashing progress. If there are any errors, it will display a message. If no errors, there will be a display indication the flashing was successful.
4. The GUI will attempt to connect to the EVM. After successfully connecting, the page will resemble Figure 5-3. If connection is not successful, follow instructions in Section 4.1and Section 4.2.

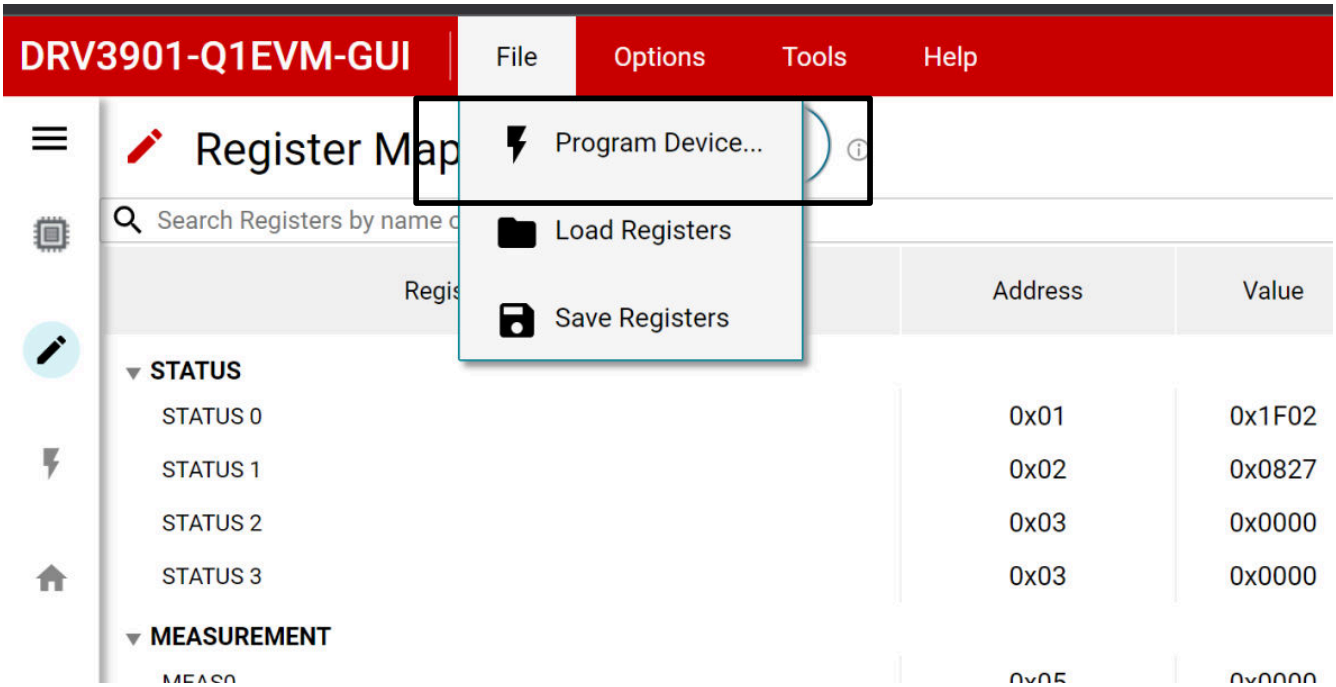

Figure 5-3. Programming the EVM

5.2 Saving and Loading Register Configurations

The DRV3901-Q1EVM GUI has a built-in feature to save the current register configurations as a .json file that can be loaded to the GUI. The following steps outline the procedure for saving and loading register configurations.

1. After writing desired register values, Click on "File" tab and "Save Registers". A save file pop-up window will appear to name and save the .json file.
2. To recall register configurations, click on "File" tab and "Load Registers". Select the saved .json file to load register values.

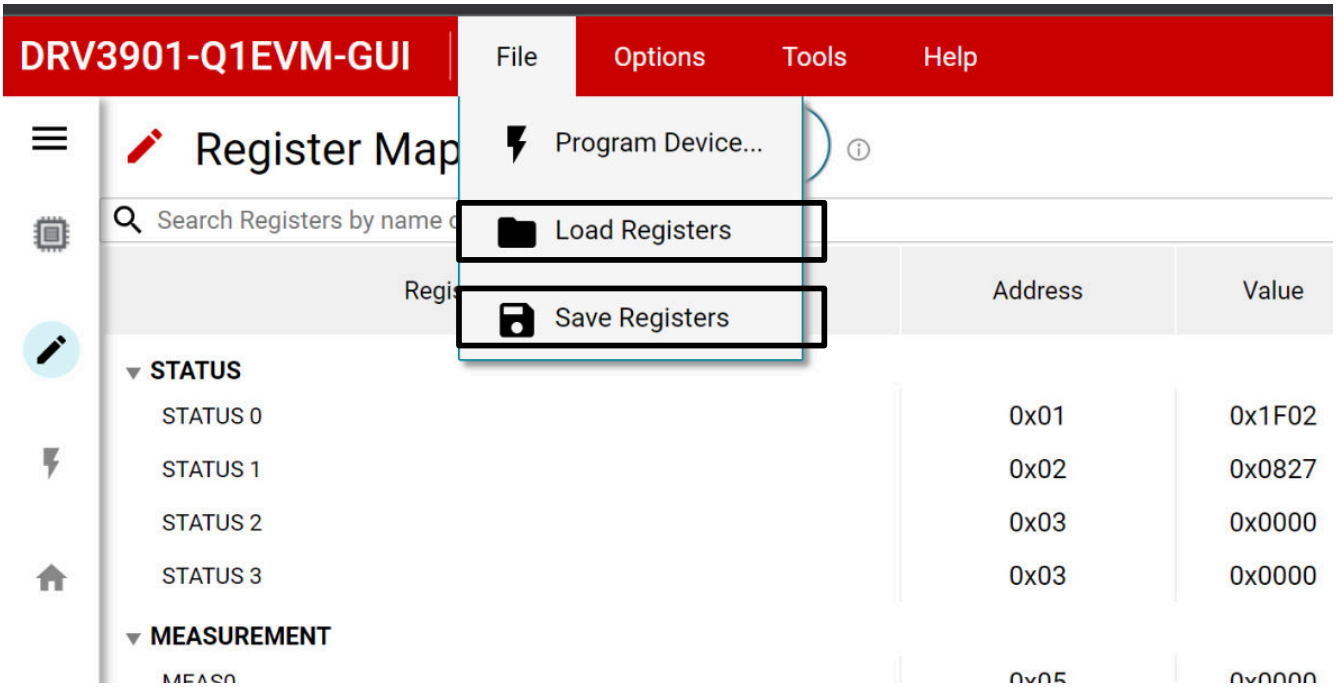

Figure 5-4. Save and Load Register Menu

5.3 Scripting Window

The DRV3901-Q1 EVM provides a scripting window to automate multiple tests and log their results. The scripting window can be opened from the tools menu as shown in the Figure 5-5.

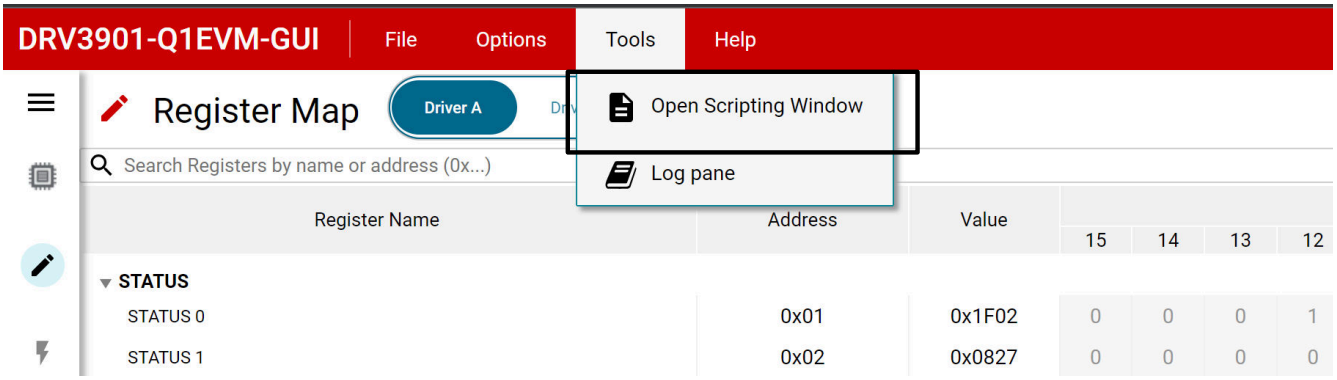

Figure 5-5. Scripting Window

In the scripting window user can implement different functions for register write, read or delays using javascript.

Various functions in the scripting window is mentioned in Figure 5-6

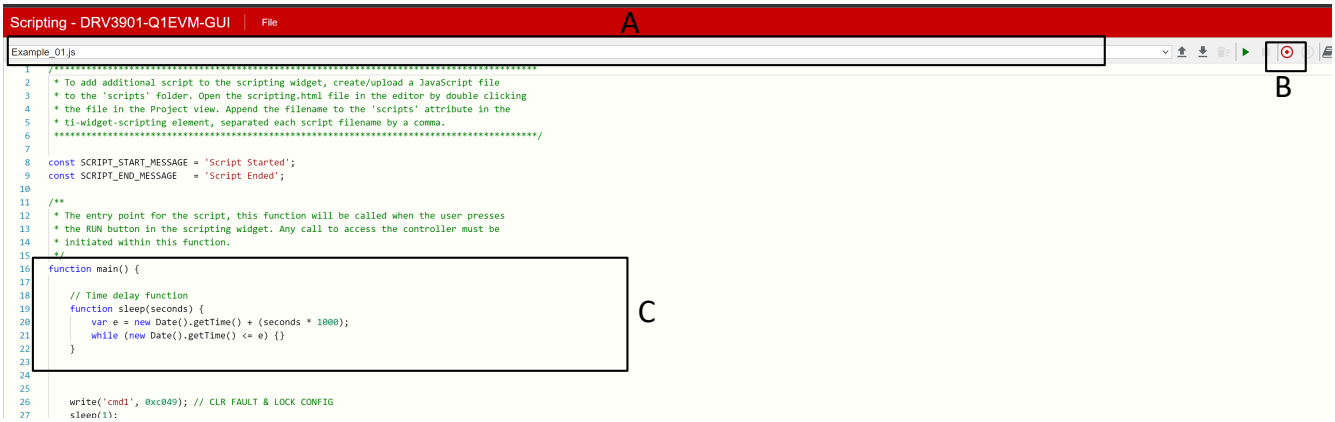

Figure 5-6. Scripting Window description

Section	Description
A	Drop down to select saved scripts
B	Record button to record commands directly from the GUI. Once this is clicked return to the GUI and do the functionalities which will auto-generate the script and can be accessed from the scripting window.
C	Script function.

6 Pyro Fuse SPI Modes

The EVM and GUI support standalone and addressable SPI, which can be selected from the driver configuration widget. In standalone SPI, only the selected driver is active with each device having a dedicated nSCS signal. In addressable SPI, the SPI bus is shared between both drivers, allowing for simultaneous SPI communication of both drivers.

6.1 Stand-alone SPI

Stand-alone SPI is the default serial communication mode. This mode is selected when one driver is controlled and the other is inactive. In stand-alone SPI mode, each driver has its own nSCS signal, and only the nSCS of the selected driver functions. Hence, SPI communication is only possible with the selected driver. The Figure 6-1 shows the SPI connections for stand-alone SPI.

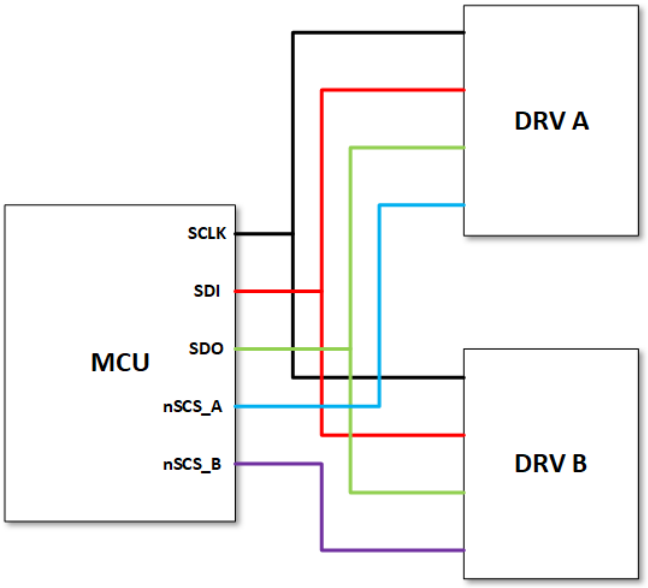

Figure 6-1. Stand-alone SPI Diagram

6.2 Addressable SPI

Addressable SPI allows SPI communication with both drivers simultaneously. In this mode, one nSCS signal is connected to both drivers. Diagram in Figure 6-2 shows the SPI connections for addressable SPI. The register map will display the register values of the selected driver. To write to a specific driver, it has to be selected in the GUI.

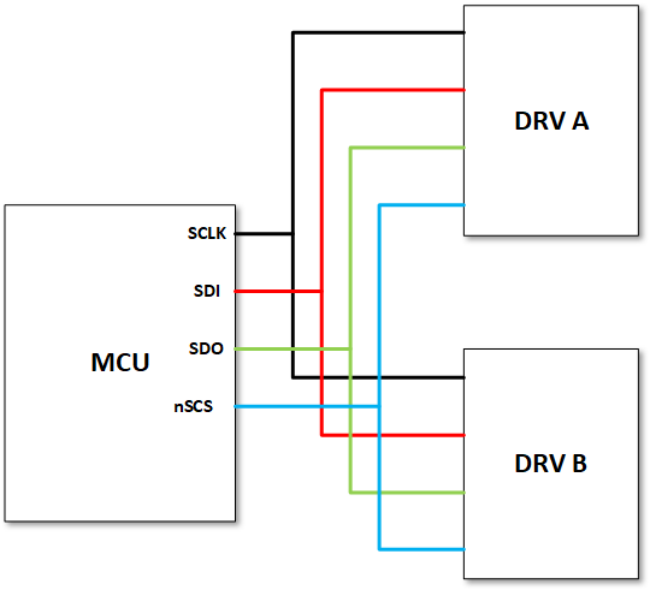

Figure 6-2. Addressable SPI Diagram

In order for communication to be successful with both drivers, the following has to be done:

- The nFAULT/NAD resistor of each driver has to be different. The NAD resistors for each driver are selected in headers J3 and J8 (Table 2-2). The resistor value needs to match the resistor selected in the GUI .

Note

The NAD/nFAULT resistors are latched during DRV3901-Q1 power up. Ensure that the desired resistors for each driver are selected in the EVM before powering up the board.

7 Revision History

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

Changes from Revision * (September 2023) to Revision A (September 2024)	Page
• Updated document for public release	1

STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

   1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software

   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 *Limited Warranty and Related Remedies/Disclaimers*:

   2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

   2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

WARNING

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

User shall operate the Evaluation Kit within TI’s recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI’s recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI’s instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGREDATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 *Regulatory Notices:*

3.1 *United States*

3.1.1 *Notice applicable to EVMs not FCC-Approved:*

FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

3.3 *Japan*

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。

https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。 技術適合証明を受けていないもののご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。 日本テキサス・インスツルメンツ株式会社

東京都新宿区西新宿 6 丁目 2 4 番 1 号

西新宿三井ビル

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

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html

3.4 *European Union*

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive)*:

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 *Safety-Related Warnings and Restrictions:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

6. *Disclaimers:*

6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

   8.1 *General Limitations*. IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS , REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

   8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

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