

DRV800x-Q1 Evaluation Module



Description

The DRV800x-Q1 evaluation module (EVM) allows for easy evaluation of the DRV800x-Q1 devices. The device has protection features such as under and over voltage monitors, offline open load and short circuit diagnostics, and zone-based thermal monitoring and shutdown protection. The device also has a muxable sense output (IPROPI) and integrate current regulation (ITRIP).

Get Started

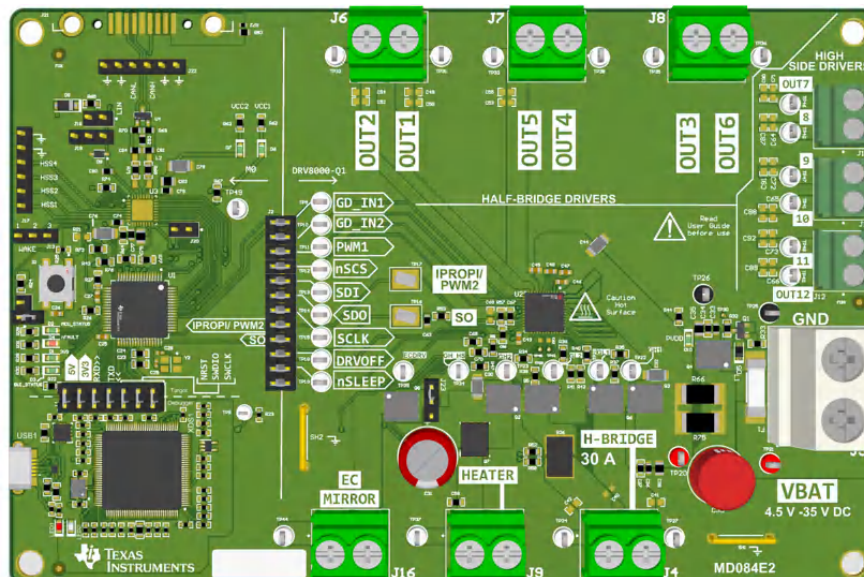
1. Order the EVM from tools page on ti.com ([DRV8000EVM](#), [DRV8001EVM](#), [DRV8003EVM](#))
2. Use the web-based GUI: <https://dev.ti.com/gallery/view/MotorDriversBSM/DRV800x-Q1/>
3. Connect USB and external power supply
4. Launch DRV800x-EVM-GUI and select the EVM variant on the home page

Features

- XDS110 USB-based on-board emulator for ease of programming and debugging MSPM0 microcontroller
- Main signal header with removable shunts to disconnect main signals going to the motor driver IC from the MCU
- GUI software to control EVM and DRV IC
- An integrated driver with an H-bridge gate driver
- Six integrated half-bridges
- Six integrated high-side drivers
- Two external high-side gate drivers, one for heater and the other for electrochromic charge
- One integrated low-side driver for electrochromic load discharge

Applications

- [Front door module](#)
- [Body control module \(BCM\)](#)
- [Zone control module](#)



DRV8000-Q1EVM

1 Evaluation Module Overview

1.1 Introduction

The DRV800x-Q1 devices integrate multiple types of drivers intended for multiple functions: driving and diagnosing motor (inductive), resistive and capacitive loads. This document is provided with the DRV800x-Q1 evaluation modules (EVM) as a supplement to the DRV800x-Q1 data sheets. This user's guide covers EVM hardware setup instructions, GUI installation, and usage instructions.

1.2 Kit Contents

[Table 1-1](#) lists the contents of the EVM kit. Contact the nearest [Texas Instruments Product Information Center](#) if any component is missing.

Table 1-1. Kit Contents

ITEM	QUANTITY
DRV800x-Q1EVM	1
3ft White USB-A to Micro-USB Cable	1

1.3 Specification

The DRV800x-Q1 EVM connects to a local computer USB port through a USB-A to Micro-USB cable. An onboard XDS110 USB emulator allows for programming and debugging the main MSPM0 microcontroller without the need for an external debugger. A 3.3V LDO generates a 3.3V rail from the USB 5V supply. This 3.3V is used to power the XDS110 MCU, main MSPM0, and motor driver DVDD pin. J2 signal header uses removable shunts to pass the signals from the MCU to the motor driver. Remove any of these shunts to easily jump in the control signals to the driver. Provide an external motor power supply to the J5 screw terminal within the operating range of the device. DRV800x-Q1 support supply voltage range 4.5V to 35V.

1.4 Device Information

The DRV800x-Q1 devices integrate multiple types of drivers intended for multiple functions: driving and diagnosing motor (inductive), resistive and capacitive loads. The device features two half-bridge gate drivers, 6 integrated half-bridges, 6 integrated highside drivers, one external high-side gate driver for heater, one external high-side gate driver for electrochromic charge and one integrated low-side driver for electrochromic load discharge.

The documents in [Table 1-2](#) provide information regarding Texas Instruments integrated circuits used in the assembly of the EVM. This user's guide is available from the TI web site under literature number SLVUCZ2. Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions are available from the TI web site at www.ti.com, or call the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number

Table 1-2. Related Device Documentation

Description	Data Sheet
XDS110 MCU	MSP432E401Y
Main MSPM0 MCU	MSPM0G3507
Motor Driver	DRV800x-Q1

2 Hardware

2.1 Headers and Test Points Information

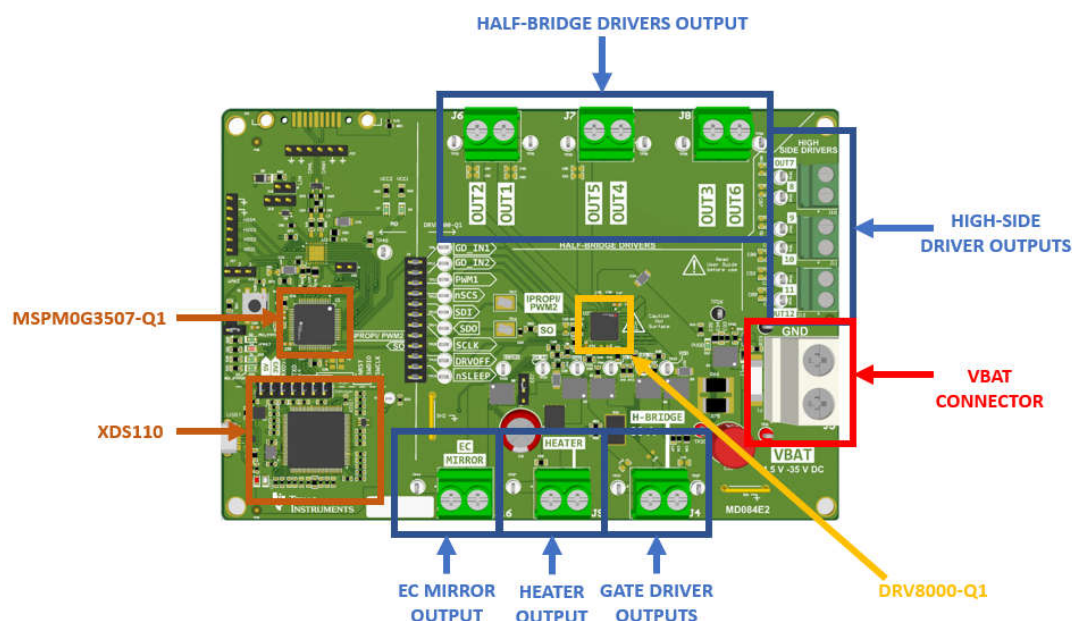


Figure 2-1. DRV8000-Q1EVM (MD084-001) (Top View)

CAUTION

Hot surface temperature. The EVM can have high surface temperatures marked by the FIRE triangular symbol on the EVM. Avoid touching the marked hot surface area when driving high currents to prevent potential burn damage.

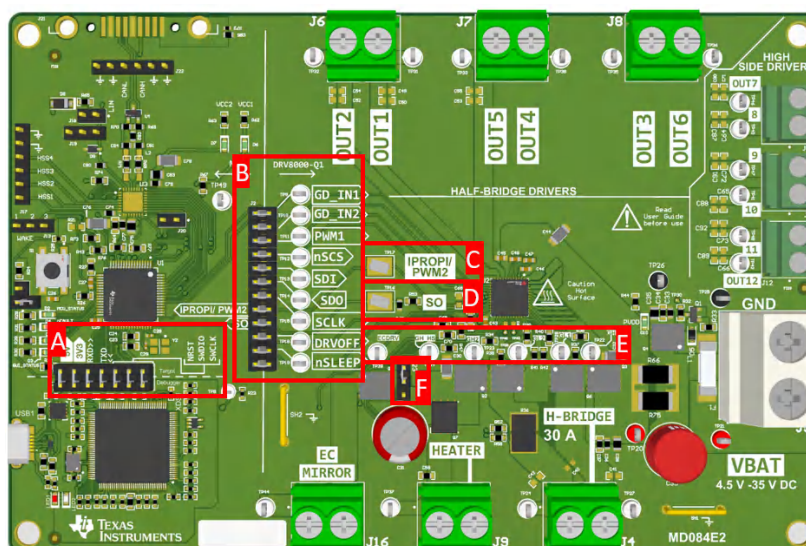


Figure 2-2. DRV8000-Q1EVM Header and Test Point Information

Table 2-1. Header and Test Point Description - DRV8000-Q1EVM

Component label	Description
Aee	XDS110 header between MSP432E401Y and MSPM0G3507 .
B	Main signal header: • GD_IN1: Half-bridge and H-bridge control input 1. • GD_IN2: Half-bridge and H-bridge control input 2. • PWM1: PWM input 1 for regulation of all drivers except electrochrome. • nSCS: Serial chip select. A logic low on this pin enables serial interface communication. Internal pullup resistor. • SDI: Serial data input. Data is captured on the falling edge of the SCLK pin. Internal pulldown resistor. • SDO: Serial data output. Data is shifted out on the rising edge of the SCLK pin. Push-pull output. • SCLK: Serial clock input. Serial data is shifted out and captured on the corresponding rising and falling edge on this pin. • DRVOFF: Gate driver shutdown pin. Logic high to pull down both high-side and low-side gate driver outputs. Internal pull-down Resistor. • nSLEEP: Device enable pin. Logic low to shutdown the device and enter sleep mode. Internal pulldown resistor.
C	IPROPI/ PWM2 - Sense output is multiplexed from any of driver load current feedback, PVDD voltage feedback, or thermal cluster temperature feedback. Can also be configured as second PWM pin input for half-bridge drivers.
D	SO - Shunt amplifier output.
E	Gate Driver, EC Driver, Heater Test points (Left to Right): • ECDRV - For EC control, pin controls the gate of external MOSFET for EC voltage regulation • GH_HS - Gate driver output for heater MOSFET. Connected to gate of high-side MOSFET • GH2 - High-side gate driver output. Connected to the gate of the high-side MOSFET. • GL2 - Low-side gate driver output. Connected to the gate of the low-side MOSFET • GL1 - Low-side gate driver output. Connected to the gate of the low-side MOSFET • GH1 - High-side gate driver output. Connect to the gate of the high-side MOSFET
F	Drain of external EC voltage regulation FET (Top to Bottom): • OUT11 - If jumper is set between OUT11 and EC FET Drain then OUT11 is the drain of the EC FET • EC FET Drain • PVDD - If jumper is set between PVDD and EC FET Drain, then PVDD is the drain of the EC FET

2.2 Connector Information

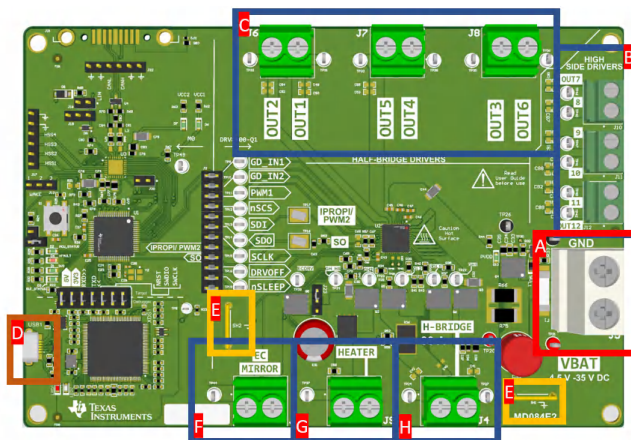


Figure 2-3. Connectors

Table 2-2. Connectors Description

Component Label	Description
A	Input power supply connector. Power cables can be directly connected to the screw terminals or clipped to the test points on either side of the connector.
B	High-side driver output connectors
C	Half-bridge output connectors
D	USB connector
E	Ground strap can be used as ground for probes and other connectors.
F	EC mirror output and ground. Ground located on the right side of terminal block.
G	Heater output and ground. Ground located on the right side of terminal block.
H	H-Bridge outputs. SH1 and SH2 are right side and left side of the terminal blocks respectively.

2.3 Indicator LEDs

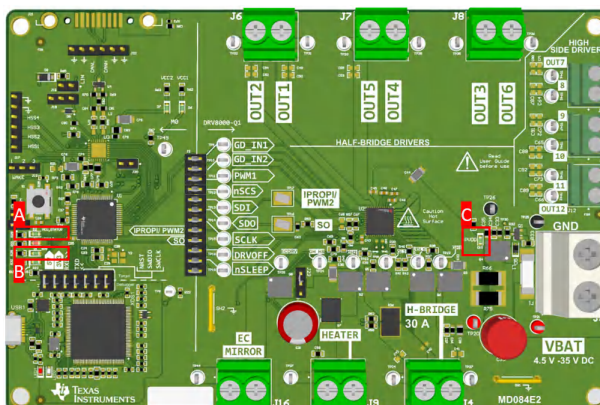


Figure 2-4. LED Indicators

LED	Function
A/D2	MCU_STATUS: LED toggles at a rate of around 1s when MCU is active. Unplug and reconnect the EVM to the computer if this stops flashing.
B/ D1	3V3: OFF when 3.3V is not active. ON when 3.3V is active
C/ D10	PVDD: OFF when PVDD is not provided. ON when PVDD is provided

2.4 Hardware Setup

The EVM hardware is designed and kitted to simplify setup and begin spinning motors. The EVM comes with the jumpers placed at the appropriate location in the headers. The location of the jumpers, also called shunts, are shown in [Figure 2-1](#).

Note

Before using the EVM, check that the shunt location matches the location shown in [Figure 2-1](#).

Before connecting the EVM to the GUI software, follow these steps:

1. Make sure all the jumpers are populated on J1 and J2 if using the GUI with the EVM controller. If users are not using the GUI and TI firmware, then users can remove all the jumpers from J2 except the bottom most jumper DVDD. Users can remove the DVDD jumper if the DVDD voltage is supplied externally and not from the onboard MCU.
2. If using the EC driver, then make sure J23 is set to the desired position.
3. Connect the micro-USB cable to micro-USB receptacle in the **XDS110 section**. LED2 illuminates.
4. Provide VBAT voltage through VBAT connector.
5. Set up is now complete. See [Figure 2-5](#) for setup image.

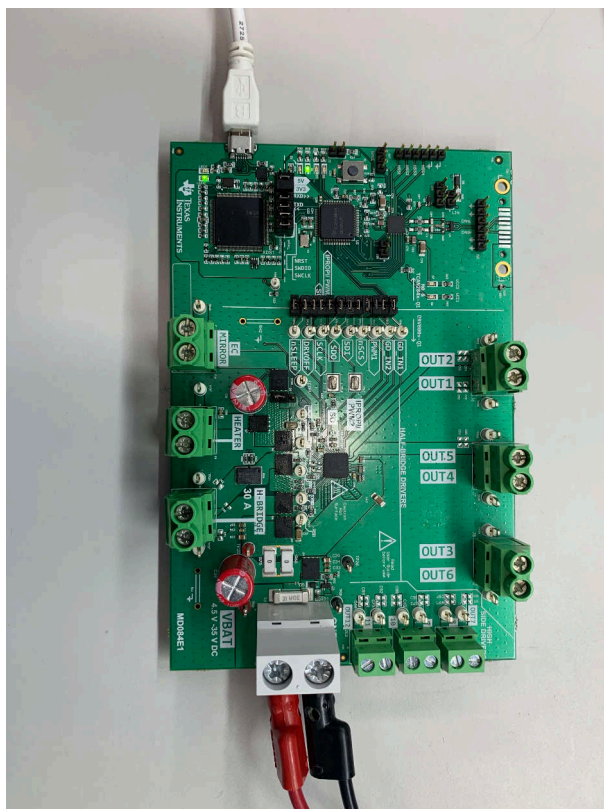


Figure 2-5. Hardware Setup

3 Software

3.1 Web GUI Access or Local GUI Installation

The EVM is controlled using a GUI application and can be accessed through a chrome-based browser or installed locally to a PC. Download the latest GUI installer [here](#) or use web-based GUI [here](#).

To use the Web GUI (recommended), follow these steps:

1. Open the latest version of the GUI at this link: <https://dev.ti.com/gallery/view/MotorDriversBSM/DRV800x-Q1/>
 - a. Alternatively, log into <https://dev.ti.com/gallery/> and search for *DRV800x* sorting by *Recently updated*.
 - b. Click on the title or blank space of the first search result to open the Web-Based GUI.

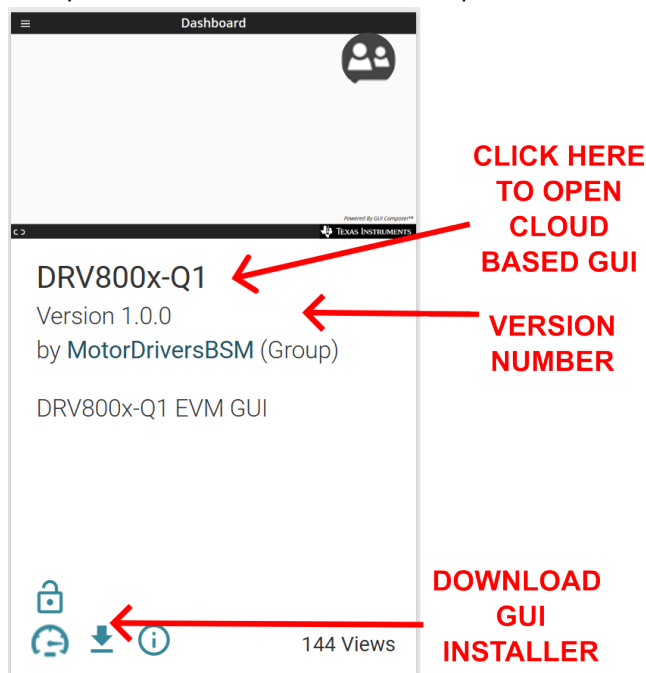


Figure 3-1. TI GUI Composer Gallery Results for Launching or Downloading Local Installer

To install the GUI locally follow these steps:

1. Log in to <https://dev.ti.com/gallery/> using myTI log in credentials. Note that the GUI composer log in searches for a very specific username match including case input at the time of sign up.
2. Open the latest version of the GUI at this link: <https://dev.ti.com/gallery/view/MotorDriversBSM/DRV800x-Q1/>
 - a. Alternatively, search for *DRV800x* sorting by *Recently updated*.
3. Hover the mouse over the *Download* icon and select the installer for the relevant operating system from the top list. Refer back to the previous section for a visual depiction of the gallery page.
4. Extract the ZIP folder with the installer and run the installer. The installer contents is self-explanatory and look slightly different for each OS.
5. Click *Next* and then agree to the terms and conditions on the following page.
6. Keep the application and runtime directory to the default locations. Click *Next* to install GUI.
7. Select *Download from Web* to download the GUI Composer Runtime if prompted, then click *Next*.
 - a. If a network firewall prevents Runtime download from the web, then the Runtime installer can be downloaded [here](#).
8. Check the box to create a desktop shortcut and click *Finish* to complete installation.
9. GUI is now installed.

3.2 Connecting EVM to GUI

Now that the EVM hardware setup and GUI installation is complete, the EVM can now be connected to the GUI. The following steps outline how to connect the EVM to GUI:

1. With the EVM connected to the PC, open the GUI. The home page is shown in [Figure 3-2](#).

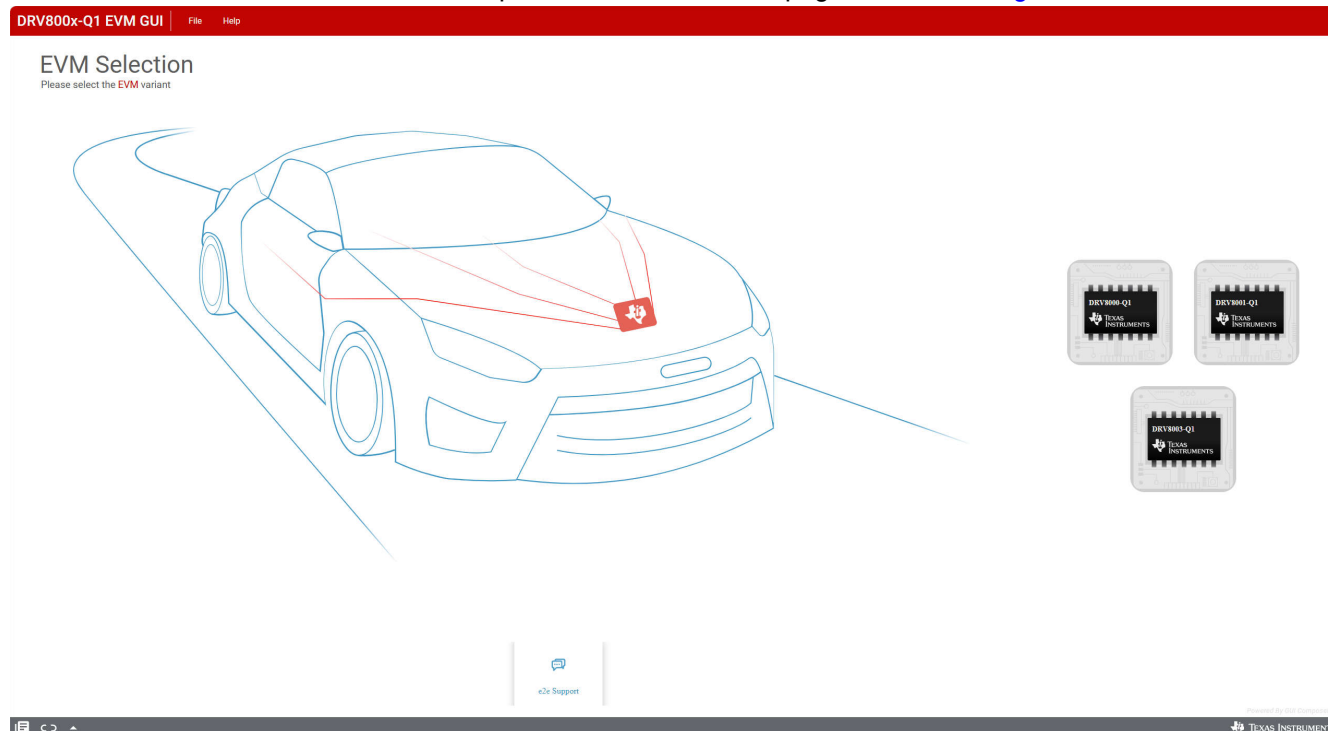


Figure 3-2. GUI Landing Page

2. Program EVM with latest software by navigating to on *File* and selecting *Program Device*. (See [Figure 3-3](#)).

This needs to be done the first time the user sets up the EVM, as a software update can have been released since the EVM was initially programmed.



Figure 3-3. Program Device

3. Select the appropriate GUI variant from the five options for the EVM ([Figure 3-3](#)).

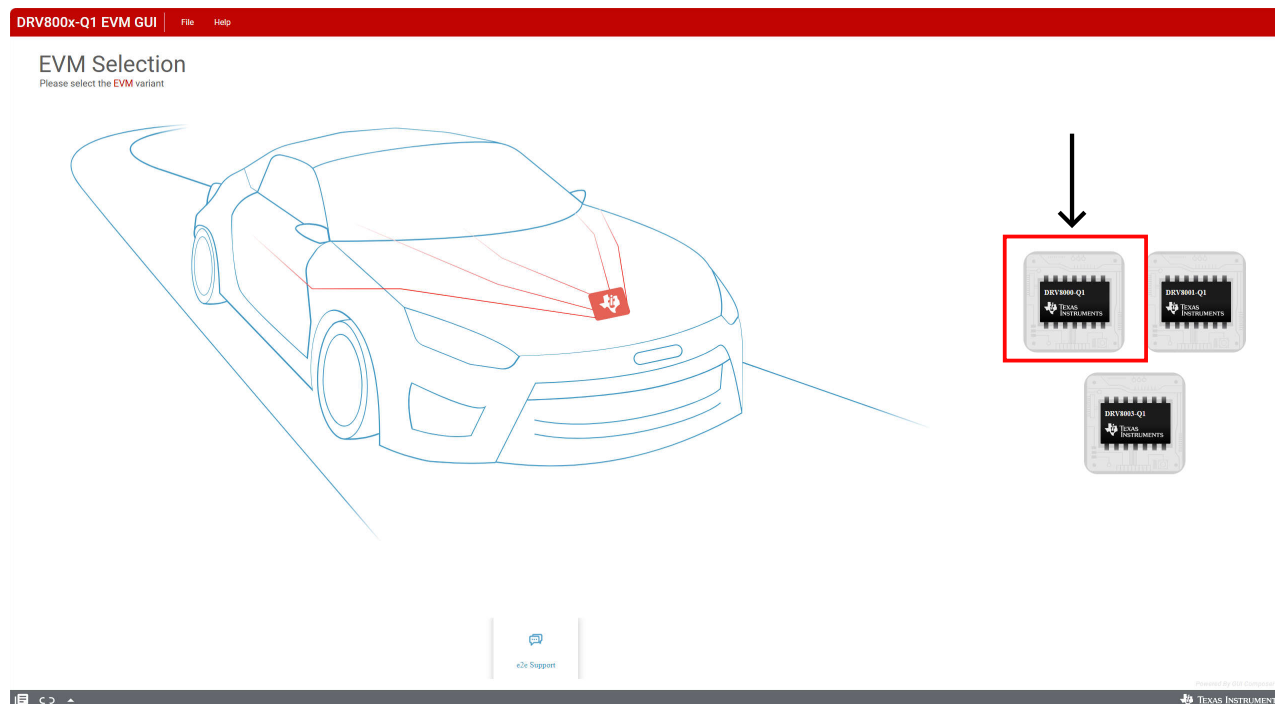


Figure 3-4. Select EVM Variant

- The GUI attempts to connect with EVM. The GUI displays the following once successfully connected. If there is no successful connection, then double check hardware setup is correct following steps in [Section 2.4](#).

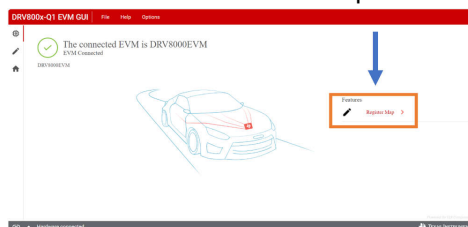


Figure 3-5. Successful GUI connection

- The GUI setup is now complete. The following section provides an overview of the GUI and how to use the GUI to control EVM.

3.3 GUI Overview

These following sections provides an overview for DRV8000-Q1EVM GUI.

3.4 DRV8000-Q1EVM

The DRV8000-Q1EVM GUIs has five main pages: *Half Bridge Controls*, *High Side Driver Controls*, *EC and Heater Controls*, *Gate Driver Controls* and *Register Map*. Each controls page gives the important register settings and hardware control to configure the respective peripheral. Each page does not offer all the controls for the peripheral; for full control, the *Register Map* page is recommended after setting basic configurations in the controls page. There is also a *IPROPI & Diagnostics* panel that can be expanded from any GUI screen.

Access the IPROPI & Diagnostics pane at any time by clicking the blue control on the right side of the screen. [Figure 3-6](#) below shows the pane opened.

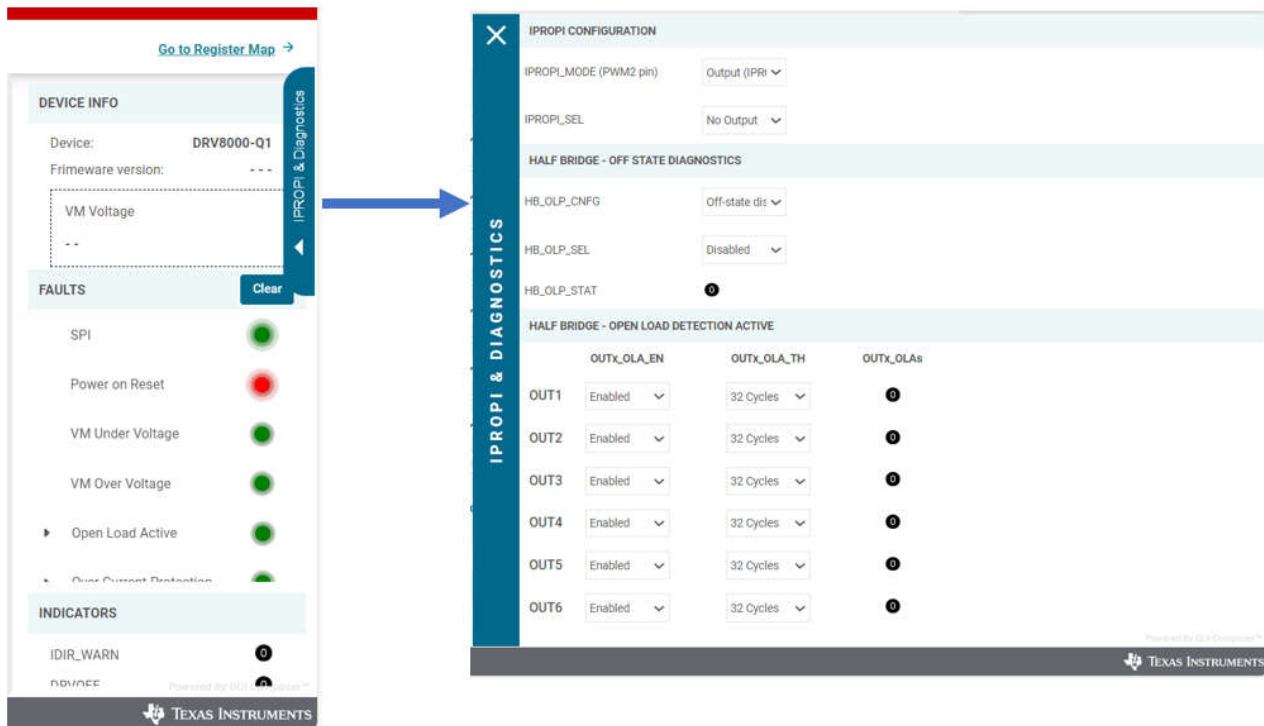


Figure 3-6. Driver Control Panel

3.4.1 Register Map

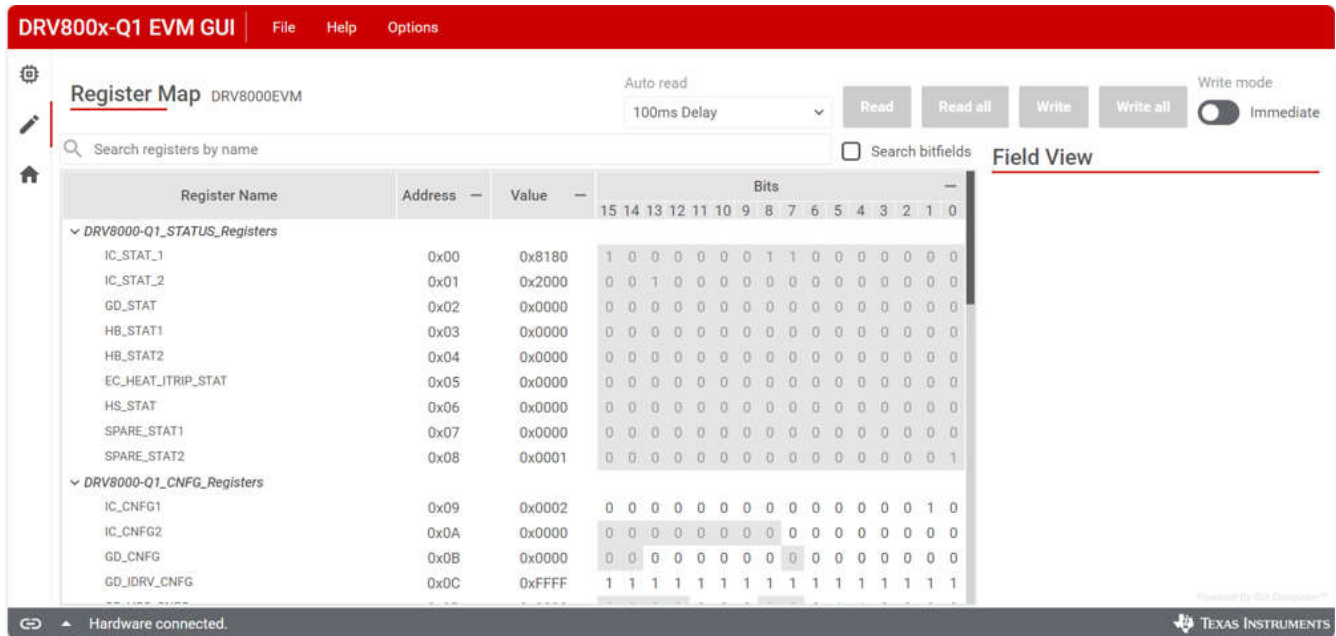


Figure 3-7. Register Map Page

The register map page is shown in Figure 3-7. The register names, address, and values are on the left hand side. The right hand side is the Field View, which provides more information regarding the bit fields of each register. The Auto Read widget sets how often the GUI reads back the register from the motor driver. The fastest option *Fast* is 500ms and the delay can be increase up to 1 minute. Setting Auto Read *Off* allows manual reading of either all registers at once or individually.

Saving and Loading Register Configurations

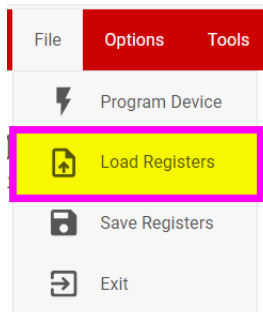


Figure 3-8. Load and Save Registers

The GUI has a built-in feature to save the current register configurations as a .json file which loads to the GUI. The following steps outline the procedure for saving and loading register configurations.

1. After writing the desired register values or using the GUI to configure the device, click on the *File* tab and click *Save Registers*. A save file pop-up window appears so the user can name and save the .json file.
2. To recall the register configurations, click on the *File* tab and then the click *Load Registers*. Select the saved .json file to load the register values.

4 Hardware Design Files

4.1 Schematics

Figure 4-1 shows the schematics for DRV8000-Q1EVM.

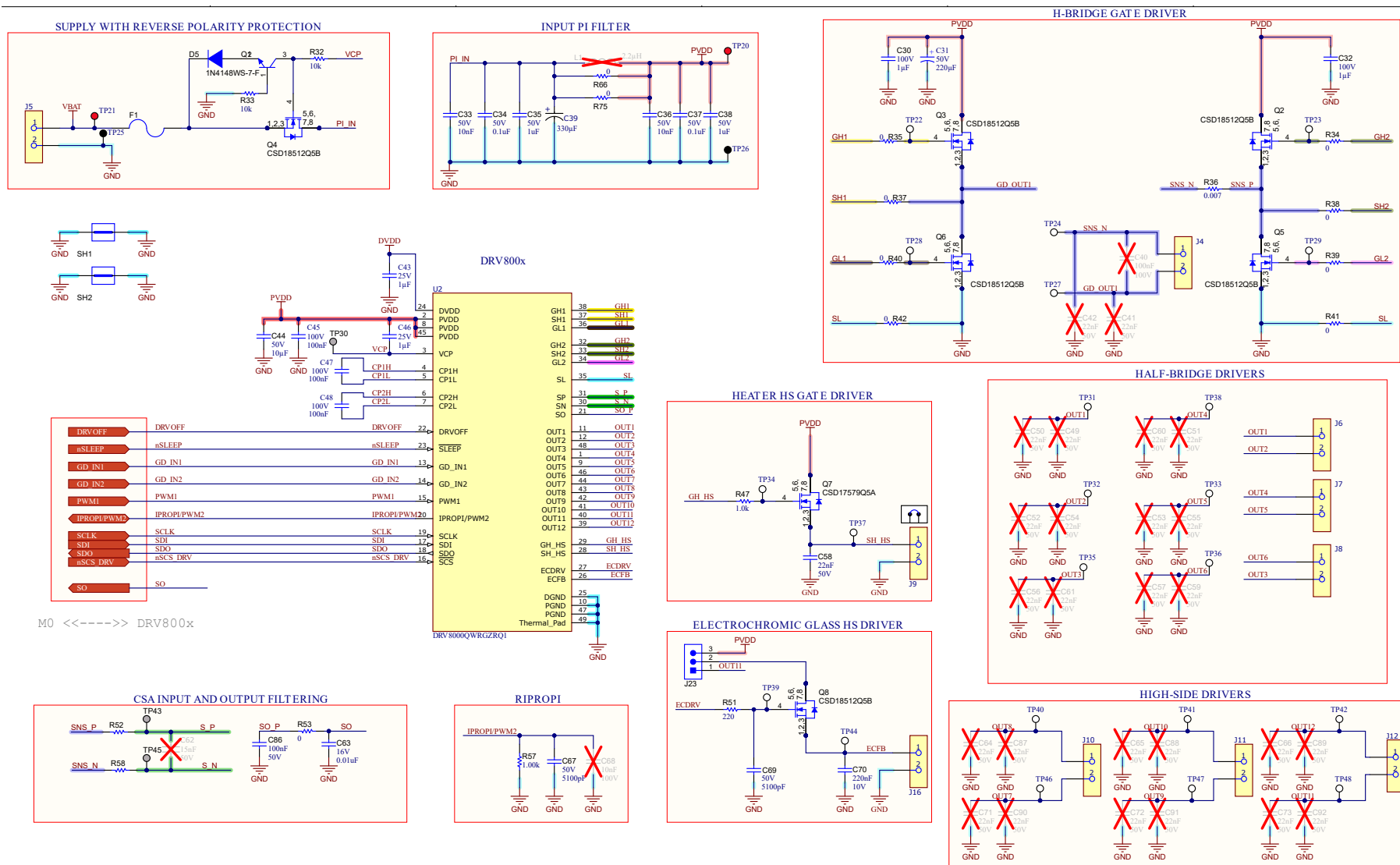


Figure 4-1. Motor Driver DRV8000-Q1

[illegible]

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4.2 PCB Layout

Figure 4-3 through Figure 4-6 show the PCB layers of the EVM. The Altium source files can be downloaded in the aforementioned *Hardware Design Files* for a given EVM.

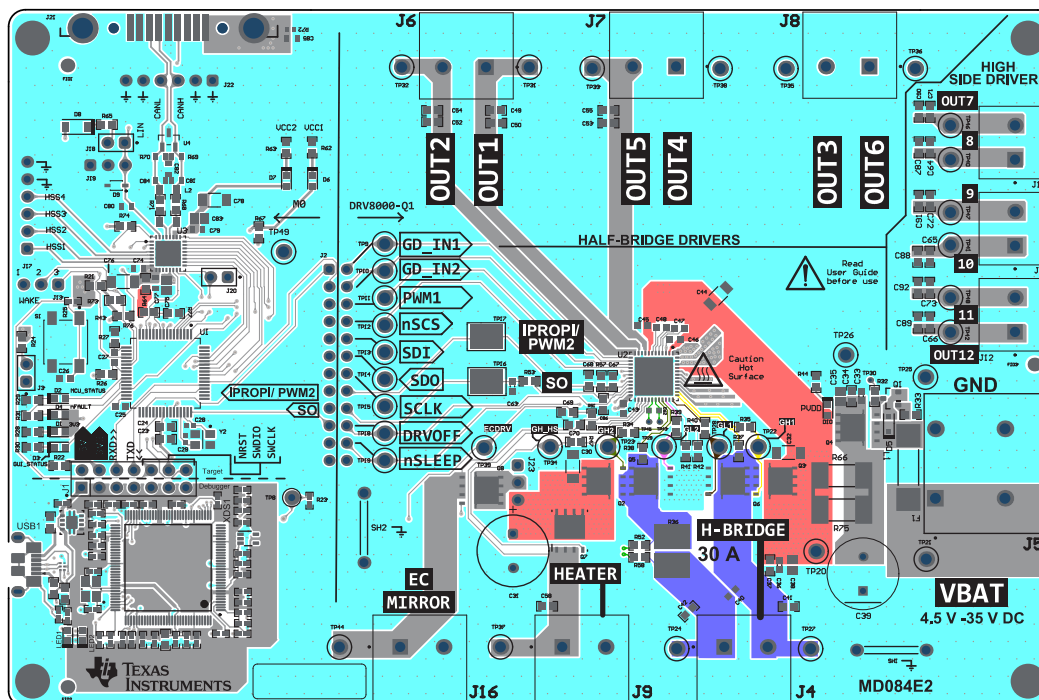


Figure 4-3. Top View

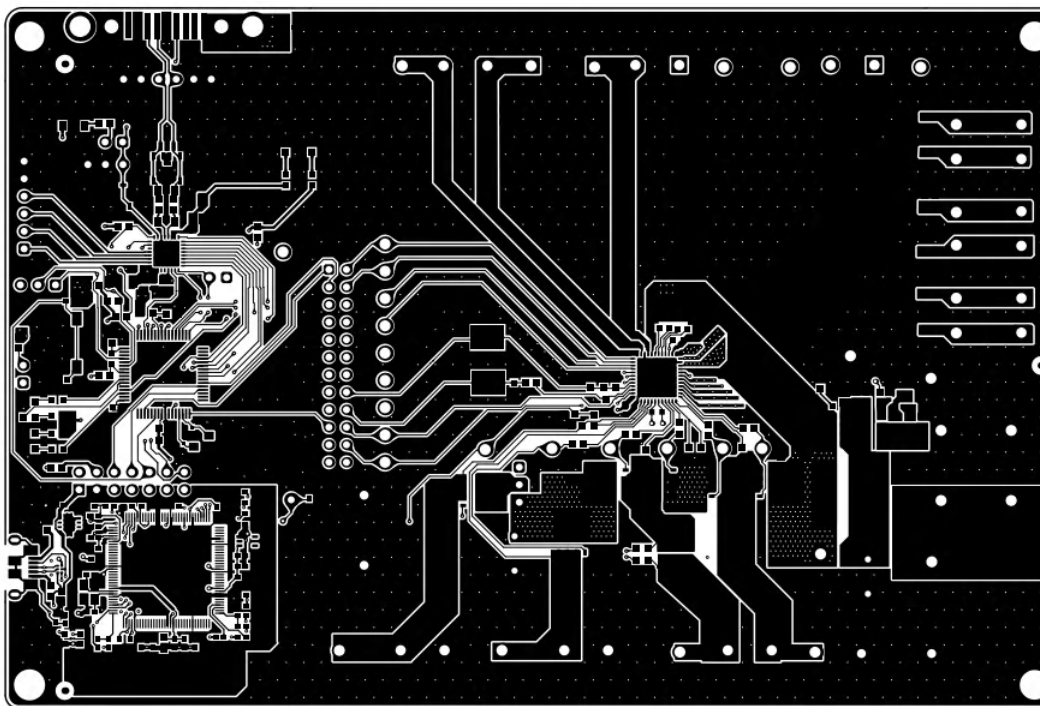


Figure 4-4. Top Layer

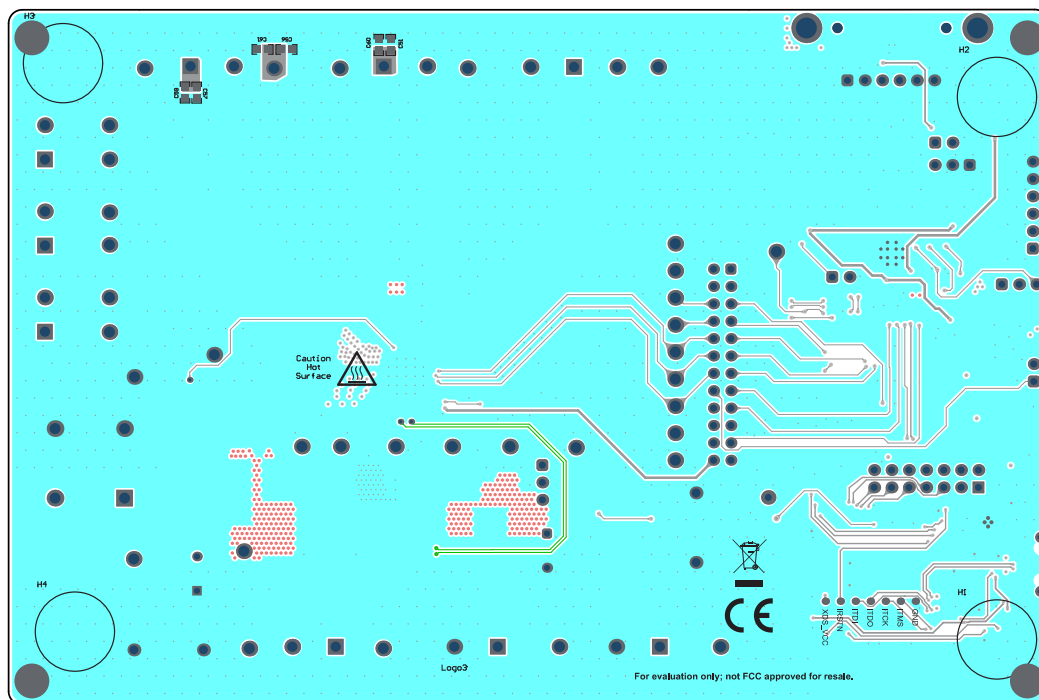


Figure 4-5. Bottom View

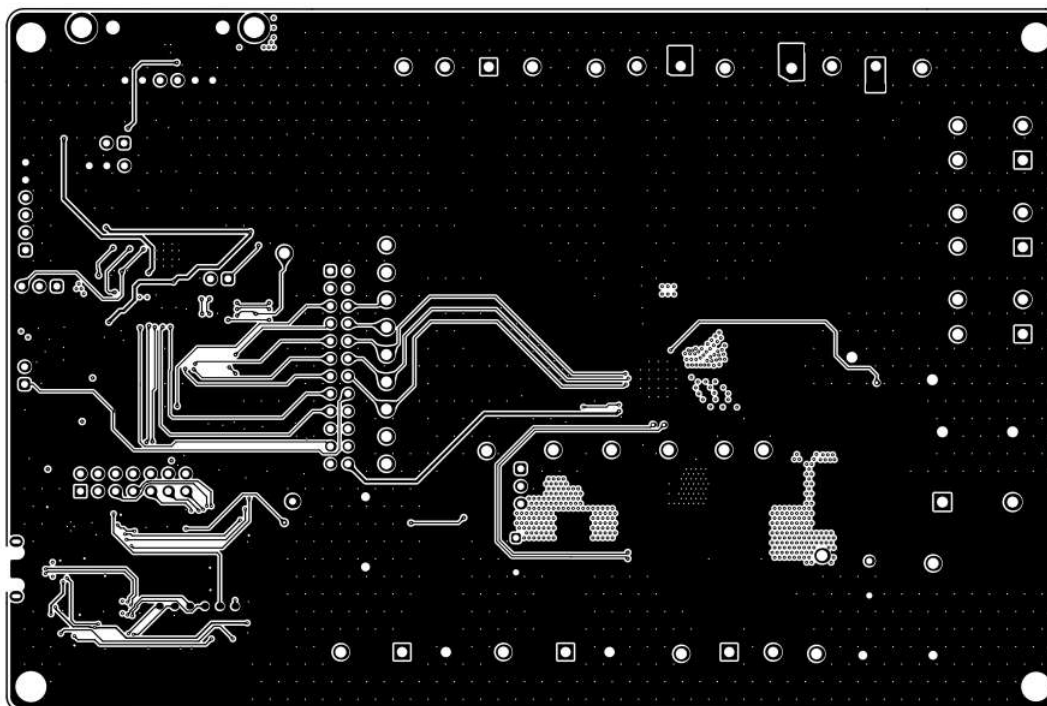


Figure 4-6. Bottom Layers

4.3 Bill of Materials (BOM)

Table 4-1 provides the parts list for DRV8000-Q1EVM.

Table 4-1. Bill of Materials

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
!PCB1	1		Printed Circuit Board		MD084	Any
C1, C15	2	2.2uF	CAP, CERM, 2.2uF, 10V, $\pm 10\%$, X5R, 0603	0603	C0603C225K8PACTU	Kemet®
C2	1	3300pF	CAP, CERM, 3300pF, 50V, $\pm 10\%$, X7R, 0402	0402	GRM155R71H332KA01D	Murata™
C3, C10, C13, C17	4	1uF	CAP, CERM, 1uF, 25V, $\pm 10\%$, X5R, 0402	0402	C1005X5R1E105K050BC	TDK
C4	1	2.2uF	CAP, CERM, 2.2uF, 6.3V, $\pm 10\%$, X5R, 0402	0402	CL05A225KQ5NNNC	Samsung
C5, C6, C7, C14, C20	5	0.01uF	CAP, CERM, 0.01uF, 25V, $\pm 10\%$, X7R, 0402	0402	GRM155R71E103KA01D	MuRata
C8, C9, C11, C12, C16, C21, C22	7	0.1uF	CAP, CERM, 0.1uF, 6.3V, $\pm 10\%$, X7R, 0402	0402	GRM155R70J104KA01D	MuRata
C18, C19	2	12pF	CAP, CERM, 12pF, 50V, $\pm 5\%$, C0G/NP0, 0402	0402	GRM1555C1H120JA01D	MuRata
C23	1	10uF	CAP, CERM, 10uF, 25V, $\pm 10\%$, X5R, 0603	0603	GRM188R61E106KA73D	MuRata
C24, C34, C37, C86	4	0.1uF	CAP, CERM, 0.1uF, 50V, $\pm 10\%$, X7R, 0603	0603	8.85012 $\times 10^{11}$	Würth Elektronik™
C25	1	470nF	WCAP-CSGP Multilayer Ceramic Chip Capacitor, General Purpose, size 0603, X7R Class II, 470nF, 25VDC	0603	885012206075R	Würth Elektronik
C26	1	10nF	WCAP-CSGP Multilayer Ceramic Chip Capacitor, General Purpose, size 0603, X7R, 10nF, 25VDC	0603	8.85012 $\times 10^{11}$	Würth Elektronik
C27	1	1uF	WCAP-CSGP Multilayer Ceramic Chip Capacitor, General Purpose, size 0603, X7R, 1uF, 50VDC	0603	8.85012 $\times 10^{11}$	Würth Elektronik
C28, C29	2	22pF	WCAP-CSGP Multilayer Ceramic Chip Capacitor, General Purpose, size 0402, NP0, 22pF, 50VDC	0402	8.85012 $\times 10^{11}$	Würth Elektronik
C30, C32	2	1uF	CAP, CERM, 1uF, 100V, $\pm 10\%$, X7R, 1206	1206	CC1206KKX7R0BB105	Yageo® America
C31	1	220uF	WCAP-ATG5 Aluminum Electrolytic Capacitor, Radial, THT, D10 $\times$ H12.5mm, 220uF, 50V		8.60021 $\times 10^{11}$	Würth Elektronik
C33, C36	2	0.01uF	CAP, CERM, 0.01uF, 50V, $\pm 10\%$, X7R, 0603	0603	8.85012 $\times 10^{11}$	Würth Elektronik
C35, C38	2	1uF	CAP, CERM, 1uF, 50V, $\pm 10\%$, X7R, 0805	0805	8.85012 $\times 10^{11}$	Würth Elektronik
C39	1		Electrolytic Capacitor, 330uF, 50V, WCAP-ATG5 Series, 20%, Radial Leaded, 10mm	RADIAL	8.60021 $\times 10^{11}$	Würth Electronics
C43, C46	2	1uF	WCAP-CSGP Multilayer Ceramic Chip Capacitor, General Purpose, size 0603, X7R, 1uF, 25VDC	0603	8.85012 $\times 10^{11}$	Würth Elektronik
C44	1	10uF	CAP, CERM, 10uF, 50V, $\pm 20\%$, X5R, 1206	1206	8.85012 $\times 10^{11}$	Würth Elektronik

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
C45, C47, C48	3	100nF	WCAP-CSGP Multilayer Ceramic Chip Capacitor, General Purpose, size 0603, X7R, 100nF, 100VDC	0603	8.85012 × 10 ¹¹	Wurth Elektronik
C58	1	0.022uF	CAP, CERM, 0.022uF, 50V, ± 10%, X7R, 0603	0603	8.85012 × 10 ¹¹	Wurth Elektronik
C63	1	0.01uF	CAP, CERM, 0.01uF, 16V, ± 10%, X7R, 0603	0603	8.85012 × 10 ¹¹	Wurth Elektronik
C67, C69	2	5100pF	CAP, CERM, 5100pF, 50V, ± 5%, C0G/NP0, 0603	0603	C0603C512J5GAC7867	Kemet®
C70	1	0.22uF	CAP, CERM, 0.22uF, 10V, ± 10%, X7R, 0603	0603	8.85012 × 10 ¹¹	Wurth Elektronik
C74, C77, C79	3	0.1uF	CAP, CERM, 0.1uF, 50V, ± 10%, X7R, 0603	0603	C1608X7R1H104K080AA	TDK
C75, C83	2	4.7uF	CAP, CERM, 4.7uF, 16V, ± 10%, X7R, AEC-Q200 Grade 1, 0805	0805	CGA4J3X7R1C475K125AE	TDK
C76, C78	2	10uF	CAP, CERM, 10uF, 50V, ± 10%, X7R, 1206	1206	CL31B106KBHNNNE	Samsung
C80	1	220pF	CAP, CERM, 220pF, 50V, ± 1%, C0G/NP0, 0603	0603	06035A221FAT2A	AVX
C81, C84	2	20pF	CAP, CERM, 20pF, 100V, ± 5%, C0G/NP0, 0603	0603	GRM1885C2A200JA01D	MuRata
C82	1	4700pF	CAP, CERM, 4700pF, 100V, ± 10%, X7R, 0603	0603	06031C472KAT2A	AVX
C85	1	0.01uF	CAP, CERM, 0.01uF, 100V, ± 10%, X7R, 0603	0603	C0603X103K1RACTU	Kemet
D1, D2, D3, D6, D7, D10	6	Green	LED, Green, SMD	LED_0603	150060VS75000	Wurth Elektronik
D4	1	Red	LED, Red, SMD	LED_0603	150060RS75000	Wurth Elektronik
D5	1	75V	Diode, Switching, 75V, 0.15A, AEC-Q101, SOD-323	SOD-323	1N4148WS-7-F	Diodes Inc.
D8	1	100V	Diode, Switching, 100V, 0.15A, SOD-123	SOD-123	1N4148W-TP	Micro Commercial Components
D9	1		24V, 1-Channel ESD Protection Diode	SOD323	ESD1LIN24DYFR	Texas Instruments
F1	1		Fuse, 30A, 250 VAC, 100 VDC, SMD	10.1 × 3.12mm	0463030.ER	Littelfuse
FID1, FID2, FID3	3		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A
H1, H2, H3, H4	4		Bump, Hemisphere, 0.44 × 0.20, Clear	Transparent Bump	SJ-5303 (CLEAR)	3M®
IC1	1		4-Channel ESD Protection Array for High-Speed Data Interfaces, DRY0006A (USON-6)	DRY0006A	TPD4E004DRYR	Texas Instruments
IC2	1		500mA, Adjustable, Low Quiescent Current, Low-Noise, High-PSRR, Single-Output LDO Regulator, DRB0008A (VSON-8)	DRB0008A	TPS73533DRBT	Texas Instruments
IC3	1		Precision Micropower Shunt Voltage Reference, 0.5% accuracy, 2.5V, 15ppm/°C, 15mA, -40°C to 85°C, 5-pin SC70 (DCK), Green (RoHS & no Sb/Br)	DCK0005A	LM4040C25IDCKR	Texas Instruments

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
J1	1		Header, 100mil, 7x2, Gold, TH	7x2 Header	TSW-107-07-G-D	Samtec®
J2	1		Header, 2.54mm, 12x2, Gold, TH	Header, 2.54mm, 12x2, TH	TSW-112-08-G-D	Samtec
J3, J18, J20	3		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec
J4, J6, J7, J8, J9, J16	6		2 Position Wire to Board Terminal Block Horizontal with Board 0.250" (6.35mm) Through Hole	CONN_TERM_BLOCK2	6.91251 × 10 ¹¹	Würth Electronics
J5	1		2 Position Wire to Board Terminal Block Horizontal with Board 0.400" (10.16mm) Through Hole	HDR2	6.91257 × 10 ¹¹	Würth
J10, J11, J12	3		2 Position Wire to Board Terminal Block Horizontal with Board 0.197" (5.00mm) Through Hole	HDR2	6.91217 × 10 ¹¹	Würth Electronics
J13, J19, J23	3		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec
J17, J22	2		Header, 100mil, 6x1, Gold, TH	6x1 Header	TSW-106-07-G-S	Samtec
LBL1	1		Thermal Transfer Printable Labels, 0.650" W × 0.200" H - 10,000 per roll	PCB Label 0.650 × 0.200 inch	THT-14-423-10	Brady®
LED1	1	Red	LED, Red, SMD	Red LED, 1.6x0.8x0.8mm	LTST-C190KRKT	Lite-On
LED2	1	Green	LED, Green, SMD	1.6 × 0.8 × 0.8mm	LTST-C190GKT	Lite-On
Q1	1	65V	Transistor, NPN, 65V, 0.1A, SOT-23	SOT-23	BC846BLT1G	ON Semiconductor
Q2, Q3, Q4, Q5, Q6, Q8	6	40V	MOSFET, N-CH, 40V, 100A, DNK0008A (VSON-CLIP-8)	DNK0008A	CSD18512Q5B	Texas Instruments
Q7	1	30V	MOSFET, N-CH, 30V, 25A, DQJ0008A (VSONP-8)	DQJ0008A	CSD17579Q5A	Texas Instruments
R1	1	330k	RES, 330k, 1%, 0.0625W, 0402	0402	RC0402FR-07330KL	Yageo America
R2, R5, R22, R26, R27, R34, R35, R37, R38, R39, R40, R41, R42, R52, R53, R58, R64, R68, R71	19	0	RES, 0, 5%, 0.1W, 0603	0603	RC0603JR-070RL	Yageo
R3	1	220k	RES, 220k, 1%, 0.0625W, 0402	0402	RC0402FR-07220KL	Yageo America
R4	1	3.30k	RES, 3.30k, 1%, 0.1W, AEC-Q200 Grade 0, 0402	0402	ERJ-2RKF3301X	Panasonic®
R6	1	1.00Meg	RES, 1.00M, 1%, 0.063W, AEC-Q200 Grade 0, 0402	0402	CRCW04021M00FKED	Vishay®-Dale
R7, R8, R14	3	10k	RES, 10k, 5%, 0.063W, AEC-Q200 Grade 0, 0402	0402	CRCW040210K0JNED	Vishay-Dale
R9, R10, R11, R12, R17	5	1.0k	RES, 1.0k, 5%, 0.063W, AEC-Q200 Grade 0, 0402	0402	CRCW04021K00JNED	Vishay-Dale

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
R13, R16	2	100	RES, 100, 5%, 0.063W, AEC-Q200 Grade 0, 0402	0402	CRCW0402100RJNED	Vishay-Dale
R15	1	4.87k	RES, 4.87k, 1%, 0.063W, AEC-Q200 Grade 0, 0402	0402	CRCW04024K87FKED	Vishay-Dale
R18	1	51	RES, 51, 5%, 0.063W, AEC-Q200 Grade 0, 0402	0402	CRCW040251R0JNED	Vishay-Dale
R19, R20	2	470	RES, 470, 5%, 0.063W, AEC-Q200 Grade 0, 0402	0402	CRCW0402470RJNED	Vishay-Dale
R23, R25	2	47k	RES, 47k, 5%, 0.063W, AEC-Q200 Grade 0, 0402	0402	CRCW040247K0JNED	Vishay-Dale
R24, R43, R73, R74	4	3.3k	RES, 3.3k, 5%, 0.1W, 0603	0603	RC0603JR-073K3L	Yageo
R28, R29, R30, R31, R63	5	330	RES, 330, 5%, 0.1W, 0603	0603	RC0603JR-07330RL	Yageo
R32, R33, R67	3	10k	RES, 10k, 5%, 0.1W, 0603	0603	RC0603JR-0710KL	Yageo
R36	1	0.007	RES, 0.007, 1%, 7W, AEC-Q200 Grade 0, 7.1x4.6mm	7.1 × 4.6mm	WSHM28187L000FEA	Vishay-Dale
R44	1	16k	RES, 16k, 5%, 0.1W, 0603	0603	RC0603JR-0716KL	Yageo
R47, R65	2	1.0k	RES, 1.0k, 5%, 0.1W, 0603	0603	RC0603JR-071KL	Yageo
R51	1	220	RES, 220, 1%, 0.1W, 0603	0603	RC0603FR-07220RL	Yageo
R57	1	1.00k	RES, 1.00k, 1%, 0.1W, 0603	0603	RC0603FR-071KL	Yageo
R62	1	560	RES, 560, 5%, 0.1W, 0603	0603	RC0603JR-07560RL	Yageo
R66, R75	2	0	RES, 0, 0.05%, 2W, AEC-Q200 Grade 0, 2512	2512	HCJ2512ZT0R00	Stackpole Electronics Inc
R69, R70	2	60.4	RES, 60.4, 1%, 0.1W, 0603	0603	RC0603FR-0760R4L	Yageo
R72	1	1.00Meg	RES, 1.00M, 1%, 0.1W, 0402	0402	ERJ-2RKF1004X	Panasonic
R76	1	20k	RES, 20k, 5%, 0.1W, 0603	0603	RC0603JR-0720KL	Yageo
R77	1	1.8k	RES, 1.8k, 5%, 0.1W, 0603	0603	RC0603JR-071K8L	Yageo
S1	1		Tactile Switch SPST-NO Top Actuated Surface Mount	SMT_SW_6MM2_6MM2	4.30481 × 10 ¹¹	Würth Electronics
SH1, SH2	2		1mm Uninsulated Shorting Plug, 10.16mm spacing, TH	Shorting Plug, 10.16mm spacing, TH	D3082-05	Harwin®
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9, SH-J10, SH-J11, SH-J12, SH-J13, SH-J14, SH-J15, SH-J16, SH-J17, SH-J18, SH-J19, SH-J20, SH-J21	21		Shunt, 2.54mm, Gold, Black	Shunt, 2.54mm, Black	60900213421	Würth Elektronik

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
TP8	1		Test Point, Miniature, White, TH	White Miniature Test point	5002	Keystone Electronics®
TP9, TP10, TP11, TP12, TP13, TP14, TP15, TP18, TP19, TP22, TP23, TP24, TP27, TP28, TP29, TP31, TP32, TP33, TP34, TP35, TP36, TP37, TP38, TP39, TP40, TP41, TP42, TP44, TP46, TP47, TP48, TP49	32		Test Point, Multipurpose, White, TH	White Multipurpose Test point	5012	Keystone Electronics
TP16, TP17	2		Test Point, Compact, SMT	Test point_Keystone_Compact	5016	Keystone Electronics
TP20, TP21	2		Test Point, Multipurpose, Red, TH	Red Multipurpose Test point	5010	Keystone Electronics
TP25, TP26	2		Test Point, Multipurpose, Black, TH	Black Multipurpose Test point	5011	Keystone Electronics
U1	1		Mixed-Signal Microcontrollers With CAN-FD Interface LQFP64	LQFP64	MSPM0G3507SPM	Texas Instruments
U2	1		Automotive Multi-function Driver with Integrated Half-bridges and HighSide and Current Sensing and Advanced Diagnostics	VQFN48	DRV8000QWRGZRQ1	Texas Instruments
U4	1		24V, 2-Channel ESD Protection Diode for In-Vehicle Networks	SOT-23-3	ESD2CAN24DBZR	Texas Instruments
USB1	1		Receptacle, USB 2.0, Micro B, 5 Position, R/A, SMT	Receptacle, USB 2.0, Micro B, 5 Pos, 0.65mm Pitch, R/A, SMT	1051640001	Molex
XDS1	1		MSP432E401YTPDT, PDT0128A (TQFP-128)	PDT0128A	MSP432E401YTPDTR	Texas Instruments
Y1	1		Crystal, 16MHz, 8pF, SMD	3.2 × 0.75 × 2.5mm	NX3225GA-16.000M-STD-CRG-1	NDK
C40	0		WCAP-CSGP Multilayer Ceramic Chip Capacitor, General Purpose, size 0603, X7R, 100nF, 100VDC			Würth Elektronik
C41, C42, C49, C50, C51, C52, C53, C54, C55, C56, C57, C59, C60, C61, C64, C65, C66, C71, C72, C73, C87, C88, C89, C90, C91, C92	0	0.022uF	CAP, CERM, 0.022uF, 50V, ± 10%, X7R, 0603	0603	8.85012 × 10 ¹¹	Würth Elektronik
C62	0		CAP CER 0.015UF 50V X7R 0603	0603	8.85012 × 10 ¹¹	Würth Electronics

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
C68	0	0.01uF	CAP, CERM, 0.01μF, 100V,± 10%, X7R, 0603	0603	8.85012 × 10 ¹¹	Würth Elektronik
J21	0		Receptacle, D-Sub, 9 Position, R/A, SMT	30.81 × 10.28 × 10.10mm	190-009-263R001	NorComp
L1	0		FIXED IND 2.2UH 16A 2.2MΩ	IND_SMT_11MM6_10MM5	74439369022	Würth Electronics
L2	0	100uH	Inductor, Ferrite, 100uH, 0.15A, 2Ω, SMD	SMD, 4-Leads, Body 4.7 × 3.7mm	ACT45B-101-2P-TL003	TDK
R21	0	0	RES, 0, 5%, 0.1W, 0603	0603	RC0603JR-070RL	Yageo
Y2	0		Crystal 40MHz ±10ppm (Tol) ±20ppm (Stability) 12pF FUND 40Ω 4-Pin Mini-CSMD T/R	TSX-3225	X1E0000210179	Seiko Epson

5 Additional Information

5.1 Trademarks

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6 Revision History

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

Changes from Revision * (May 2024) to Revision A (July 2026)	Page
• Added DRV8001EVM and DRV8003EVM.....	1
• Updated Figure 3-1 to show the current GUI.....	7
• Updated Figure 3-2 to show the current GUI.....	8

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