



## ABSTRACT

This document is provided with the [DRV8311HEVM customer evaluation module \(EVM\)](#) to evaluate the [DRV8311 3-V to 20-V Three-Phase Smart Gate Driver](#). This User's Guide details the implementation of the EVM and shows how to set up and power the board with the [LAUNCHXL-F280049C \(C2000 Piccolo MCU F280049C LaunchPad™ development kit\)](#).

### Note

The DRV8311HEVM comes automatically populated with and configured for the DRV8311H hardware device. It is also compatible for the DRV8311S and DRV8311P variants, but the user will need to modify the board to make it compatible for the SPI/tSPI devices (see [Section 4.4](#)).

### Note

For the DRV8311H Hardware settings to work, R7 must be removed and 3.3 V must be supplied externally or from the LaunchPad. Please see section DRV8311H Compatibility.

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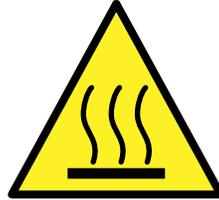
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## 1 Cautions and Warnings

Observe the following cautions and warnings as printed on the EVM board.

**HOT SURFACE:**



**Caution Hot Surface! Contact may cause burns. Do not touch. Please take the proper precautions when operating.**

## 2 Introduction

The [DRV8311](#) is a 3-V to 20-V, 5-A peak integrated three-phase integrated FET driver IC for motor drive applications. It provides three accurately trimmed and temperature compensated half-bridges capable of directly driving a 3-phase Brushless-DC motor. The DRV8311 integrates multiple control interface options, low-side integrated current sense resistors and sense amplifiers, a 3.3-V 100-mA LDO regulator, and a variety of protection and control features. The device is available in the hardware variant (DRV8311H), SPI variant (DRV8311S), and Texas Instruments SPI (tSPI) variant (DRV8311P) as shown in [Table 2-1](#). For more information on tSPI, please see [Section 4.4.3](#) and visit the DRV8311 product page for more resources.

**Table 2-1. DRV8311x Device Variants**

Device Name	Device Description
DRV8311H	Hardware variant
DRV8311S	SPI variant
DRV8311P	Texas Instruments SPI (tSPI) variant

The DRV8311HEVM can be interfaced with the [TMS320F280049C microcontroller](#) on the [LAUNCHXL-F280049C LaunchPad](#) in correspondence with the reference software to provide the algorithm to the DRV8311 to control the BLDC motor.

This document serves as a startup guide to supplement the DRV8311HEVM + LAUNCHXL-F280049C BLDC motor control demo kit. It also is intended to help engineers design, implement, and validate reference hardware and software for the LaunchPad MCU and DRV8311. For step by step details on connecting the LAUNCHXL-F280049C + DRV8311HEVM, installing software, and running the project to spin a motor, refer to [Section 5](#).

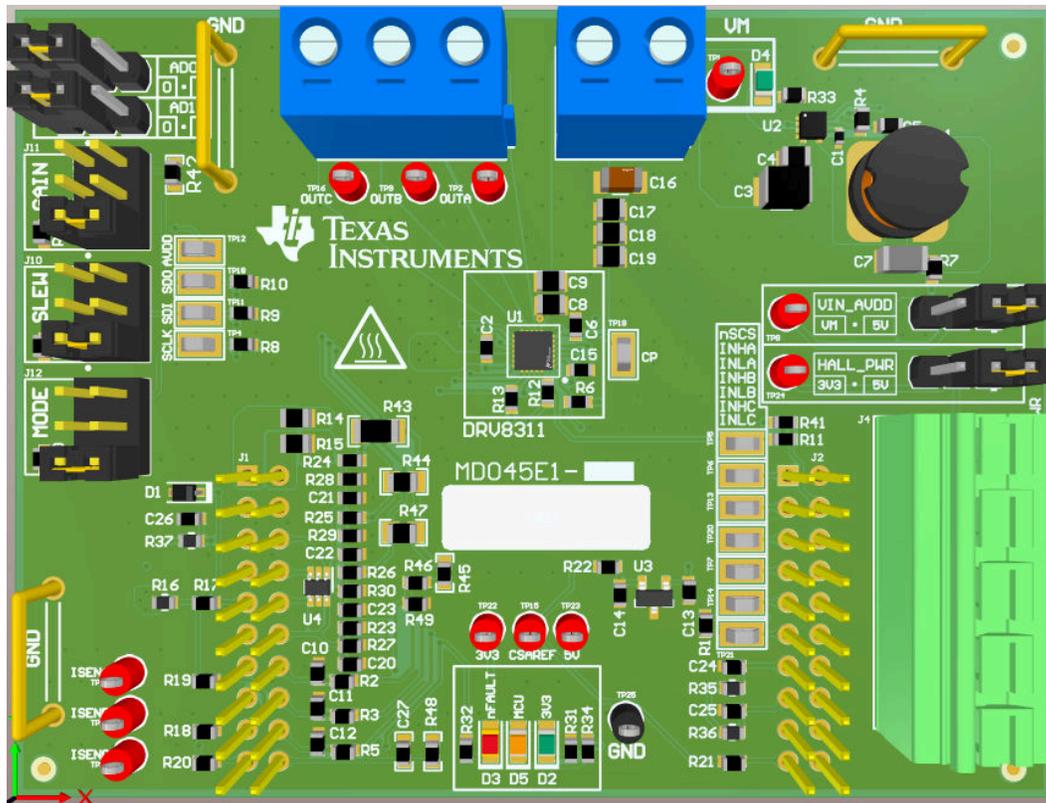


Figure 2-1. DRV8311HEVM PCB Layout

### 3 Quick Start Guide

The DRV8311HEVM requires a power supply with a recommended operating range from 3-V to 20-V. To setup and power the EVM, follow the sequence below:

1. Connect the power supply ground to the GND of the 2-pin power connector J3 and the power supply positive terminal to the VM pin of J3. Ensure jumpers JP1, JP2, and JP3 of the LAUNCHXL-F280049C are populated to ensure that 3.3 V and 5 V are powered from the LaunchPad.
2. Connect the motor phases to OUTA, OUTB, and OUTC in the correct order. For sensed applications, connect the Hall sensors to the appropriate locations on the 5-pin connector J4 as shown in [Figure 4-2](#). Select 3V3 or 5V on jumper J6 to choose the Hall power source voltage.
3. Mate the DRV8311HEVM onto the top half of the LAUNCHXL-F280049C (LaunchPad Headers J1/J3 and J2/J4) as shown in [Figure 4-3](#). The motor and power connectors should face the same direction as the Micro-USB connector on the LaunchPad.
4. Connect a Micro-USB cable from the computer into the Micro USB connector on the top of the LAUNCHXL-F280049C.
5. Power on the DRV8311HEVM.

## 4 Hardware and Software Overview

### 4.1 Hardware Connections Overview – DRV8311HEVM + LAUNCHXL-F280049C

Figure 4-1 shows the major hardware blocks of the DRV8311HEVM. The DRV8311HEVM is designed for an input supply from 3-V to 20-V. The DRV8311 includes three integrated half-bridges that can drive up to 5-A peak current which can be used in conjunction with an external MCU for sensed or sensorless trapezoidal control, sinusoidal control, or Field-oriented control (FOC).

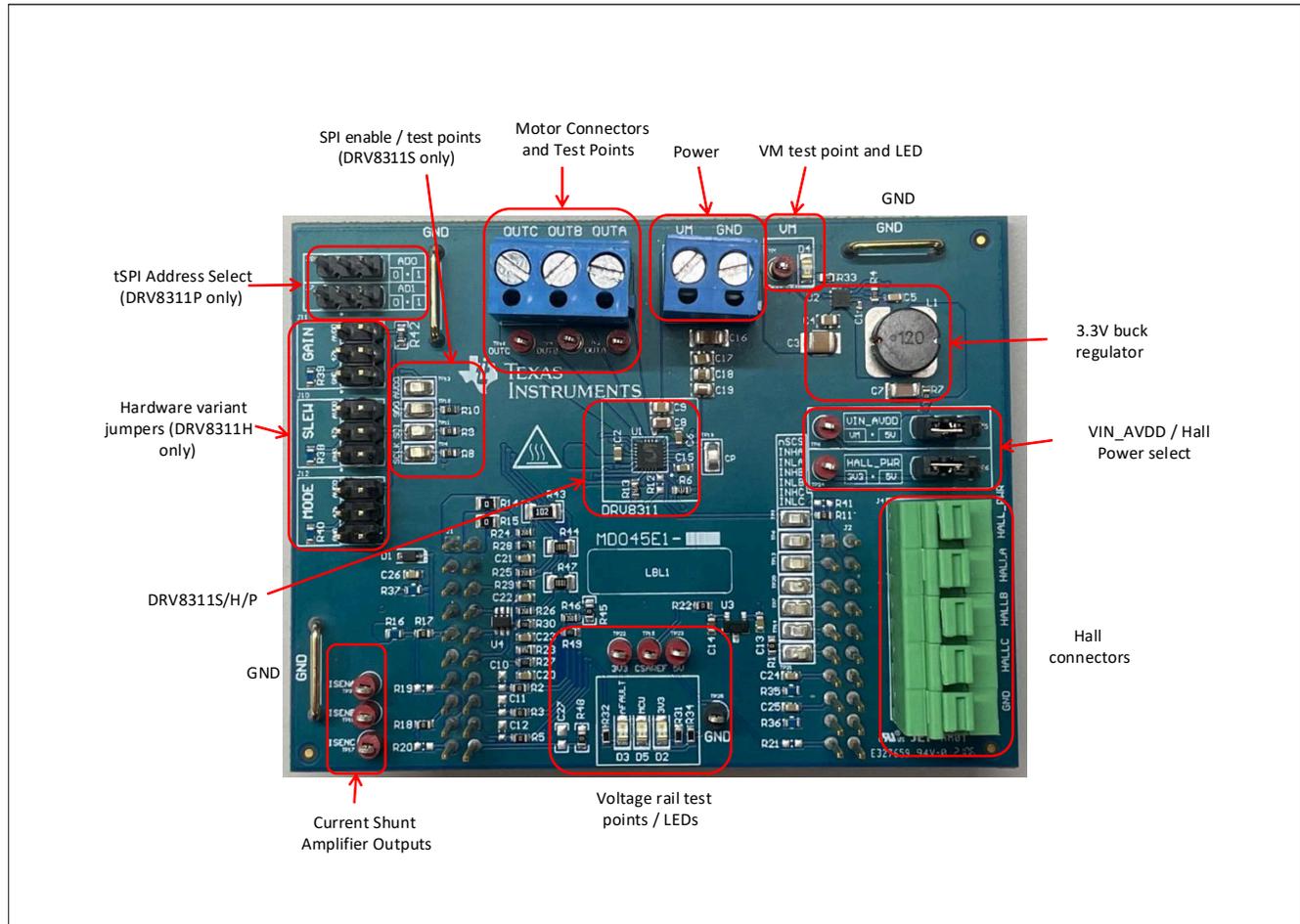


Figure 4-1. Major hardware blocks of the DRV8311HEVM

### 4.2 Connection Details

Figure 4-2 shows the power supply and motor connections made to the DRV8311HEVM in order to spin a 3-phase sensed or sensorless Brushless-DC motor.

A 3-V to 20-V power supply or battery is connected to the VM and GND terminals. The three phases of the BLDC motor connect directly to the OUTA, OUTB, and OUTC terminals of the screw terminal provided on the DRV8311HEVM.

For sensed applications, to connect the Hall sensor outputs to the Hall connectors on the DRV8311HEVM, push down on the respective terminals to open the sockets and insert the Hall sensor wires.

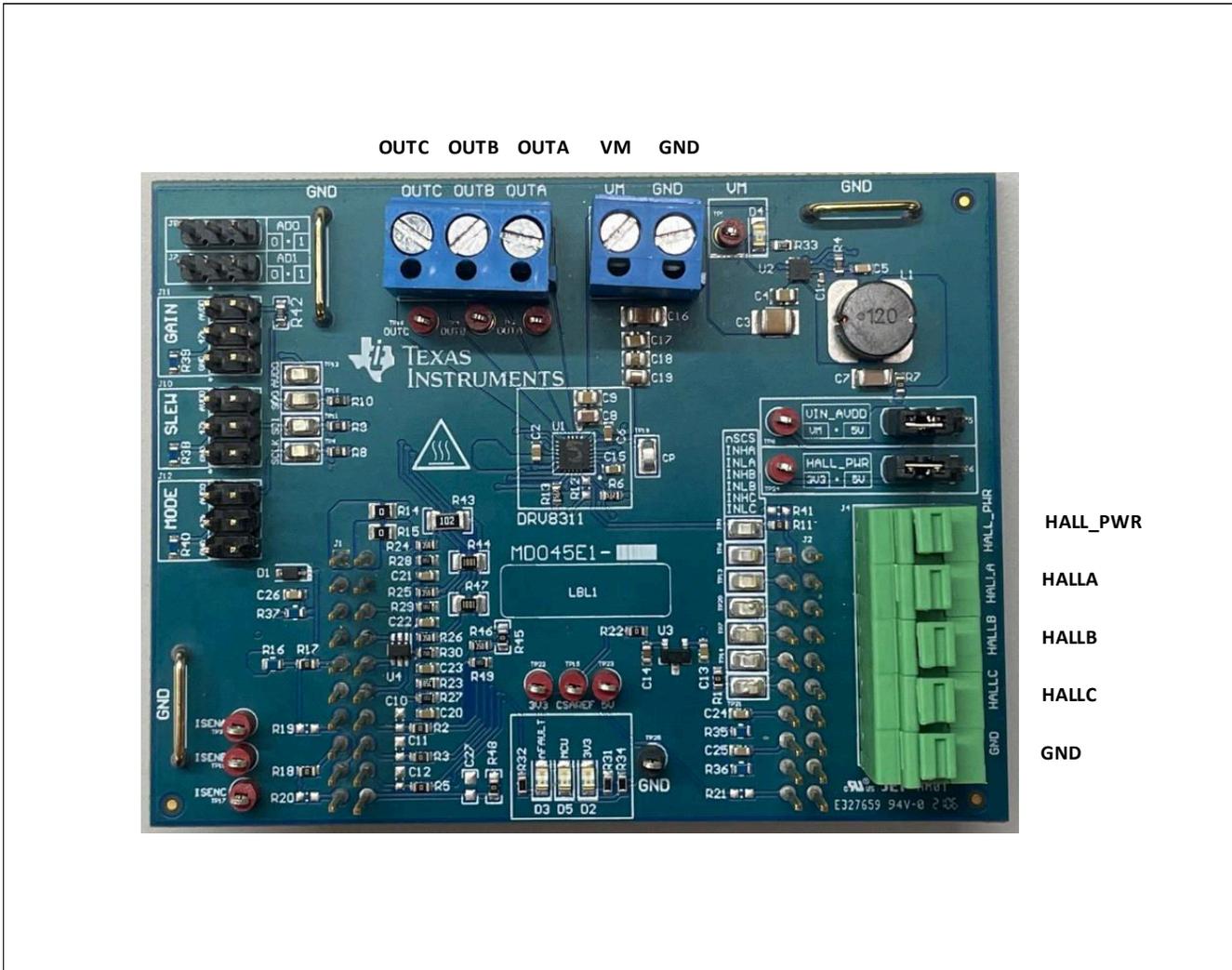
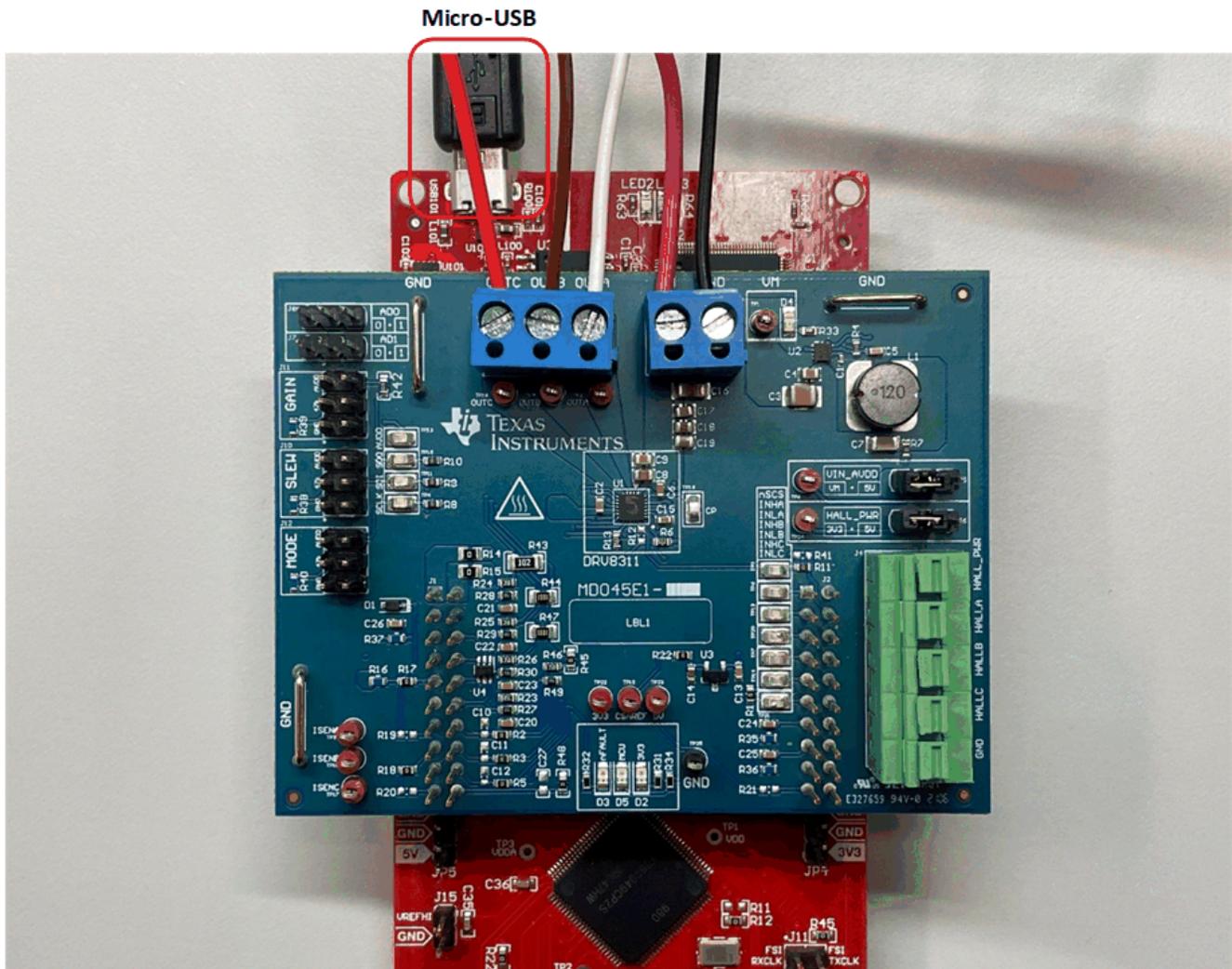


Figure 4-2. Connections from motor to DRV8311HEVM

Figure 4-3 shows where the Micro-USB cable is plugged in to the LAUNCHXL-F280049C to provide communication between the LaunchPad firmware and GUI as well as the correct installment of the DRV8311HEVM to the J1/J3 and J2/J4 headers of the LaunchPad.



**Figure 4-3. DRV8311HEVM on headers J1/J3 and J2/J4 of LaunchPad and Micro-USB plugged into LaunchPad**

### 4.3 LED Lights

There are LED indicators on both the LAUNCHXL-F280049C and DRV8311HEVM when power is provided and the micro USB cable is plugged in to the LaunchPad.

The DRV8311HEVM has 4 status LEDs on the board. By default, the VM and 3V3 LEDs will light up when the board is powered on. The fault LED will light up when the driver reports a fault, and the MCU LED (tied to GPIO59) can be used for debugging and validation. [Table 4-1](#) shows the LED descriptions, with the LEDs that are on during power up indicated in bold. [Figure 4-4](#) shows the LED locations on the EVM.

**Table 4-1. Description of DRV8311HEVM LEDs (on during power up in bold)**

Designator	Name	Color	Description
D2	<b>3V3</b>	<b>Green</b>	<b>AVDD is outputting 3.3 V</b>
D3	nFAULT	Red	Lights up when fault condition has occurred on DRV8311
D4	<b>VM</b>	<b>Green</b>	<b>Power is supplied to the board</b>
D5	MCU_LED	Orange	MCU debugging

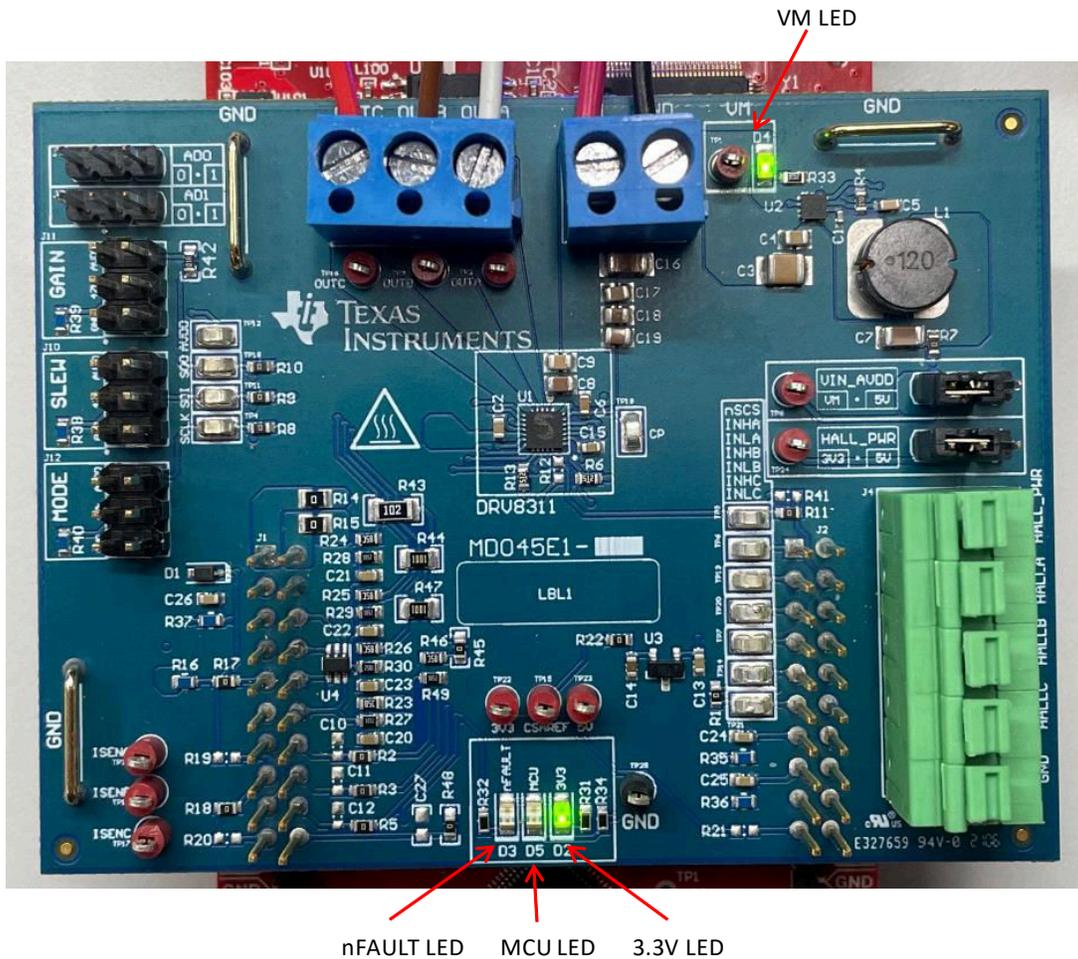


Figure 4-4. DRV8311HEVM LEDs

#### 4.4 DRV8311HEVM Configurability – Jumpers and Resistors

The DRV8311HEVM includes a variety of user-selectable jumpers and unpopulated components on the PCB to choose user settings and evaluate the DRV8311S, DRV8311H, or DRV8311P device. A summary of those selectable settings is listed in [Table 4-2](#) (defaults in bold) and can be seen on the board in [Figure 4-5](#). [Section 4.4.2](#) and [Section 4.4.3](#) describes the changes that need to be made to the board in order to use the SPI and tSPI variants as the main motor driver IC.

Table 4-2. Description of user selectable settings on DRV8311HEVM (H variant defaults in bold)

Id.	Setting Name	Description	Position	Function
A	AD0 select	(DRV8311P only) Use J8 and J7 jumpers to select device address. DNP jumper if DRV8311P is not used.	J8 = Left	AD0 = 0
	AD1 select		J8 = Right	AD0 = 1
			J7 = Left	AD1 = 0
			J7 = Right	AD1 = 1

**Table 4-2. Description of user selectable settings on DRV8311HEVM (H variant defaults in bold)  
(continued)**

Id.	Setting Name	Description	Position	Function
B	GAIN select	(DRV8311H only) Use J11 to select desired gain settings. DNP jumper if DRV8311H is not used.	<b>J11 = Bottom</b>	<b>0.25 V/A</b>
			J11 = Middle	0.5 V/A
			J11 = No Jumper	1 V/A
			J11 = Top	2 V/A
C	SLEW select	(DRV8311H only) Use J10 jumper to select desired slew rate settings. DNP jumper if DRV8311H is not used.	J10 = Bottom	25 V/us
			J10 = Middle	50 V/us
			J10 = No Jumper	125 V/us
			<b>J10 = Top</b>	<b>200 V/us</b>
D	MODE select	(DRV8311H only) Use J12 jumper to select desired PWM mode. DNP jumper if DRV8311H is not used.	<b>J12 = Bottom</b>	<b>6x PWM mode</b>
			J12 = Middle	6x PWM mode
			J12 = No Jumper	3x PWM mode
			J12 = Top	3x PWM mode
E	Power LaunchPad from buck	0-ohm resistor used to supply power from buck to LaunchPad. DNP if powering LaunchPad externally see section _ on MCU Power		<b>See section 3.4.4 MCU power options</b>
F	Supply 5 V from LaunchPad	Supplies 5 V to some of the EVM circuitry from the F280049C LaunchPad boost converter.	<b>R15 is populated</b>	<b>Supply 5 V from LaunchPad</b>
			R15 is DNP	Supply 5 V externally from TP23
G	Supply 3.3 V from buck	Connects buck 3.3 V voltage to supply main 3.3 V.	<b>R7 is populated</b>	<b>Connects buck output to supply 3.3 V rail</b>
			R7 is DNP	Supply 3.3 V externally from TP22
H	VIN_AVDD select	Use J5 to supply VIN_AVDD voltage from either VM or 5 V.	<b>J5 = Left</b>	<b>VIN_AVDD supplied from VM</b>
			J5 = Right	VIN_AVDD supplied from 5 V
I	HALL_PWR select	Use J6 to supply Hall power from 3.3 V or 5 V.	<b>J6 = Left</b>	<b>Hall power supplied from 3.3 V</b>
			J6 = Right	Hall power supplied from 5 V
J	S/H/P variant connections	Populate specific resistors to properly use the SPI, Hardware, or tSPI variant.	Populate R1, R8, R9, R10, R11, and R13 DNP R12 and R41	SPI connections

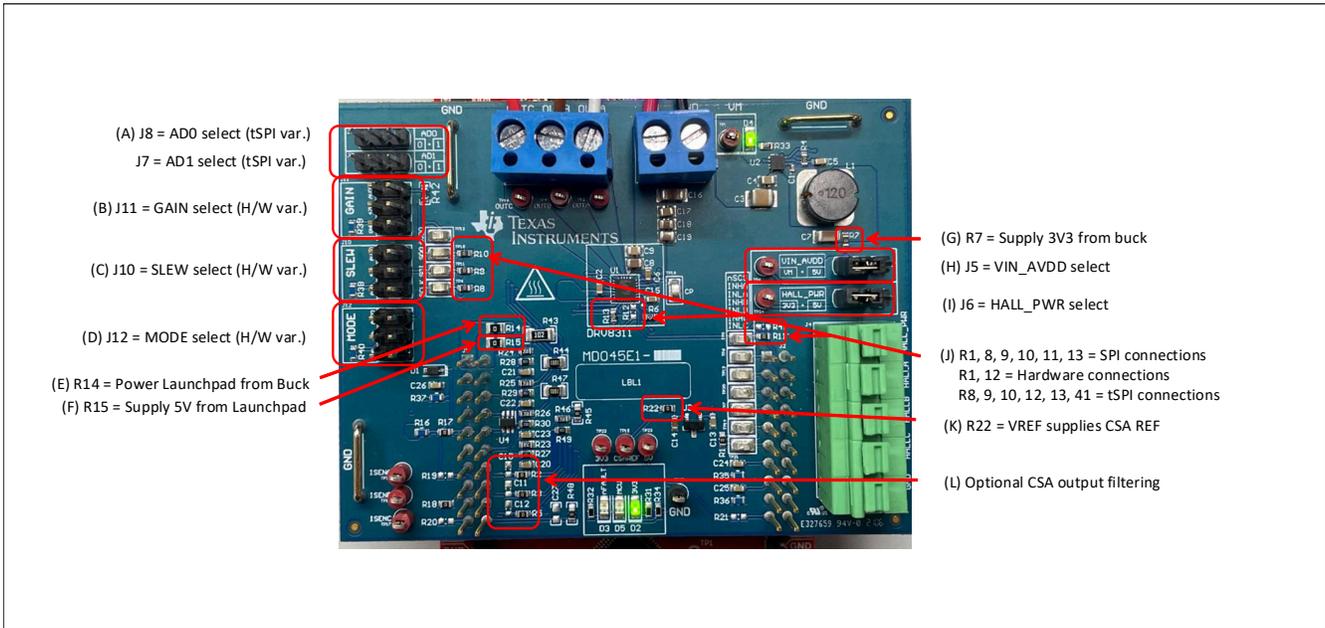


Figure 4-5. User-selectable jumpers and DNP components on DRV8311HEVM

#### 4.4.1 DRV8311H Compatibility

The DRV8311HEVM default is the DRV8311H (Hardware variant), which can be used to spin a 3-phase Brushless-DC motor with selectable modes configured with hardware settings as shown in Table 4-3.

#### Note

DRV8311H Hardware settings are stuck at default settings (GAIN = 0.5V/A, SLEW = 200V/us, MODE = 6x PWM) for MD045A. N\_FAULT must be pulled up externally before VM > UVLO to latch the correct H/W settings. To fix, implement once of the following workarounds:

1. If using the DRV8311HEVM with an external MCU, remove R7 to disconnect buck supply. Apply external 3.3V to the 3.3V test point. Power on the DRV8311HEVM.
2. If using the DRV8311HEVM with the LAUNCHXL-F280049C, remove R7 to disconnect buck supply. Connect the LaunchPad to the DRV8311HEVM, and connect the micro-USB cable into the LaunchPad to power the 3.3V supply to the DRV8311HEVM. Power on the DRV8311HEVM.

When using the DRV8311H, resistors R1, and R12 must be populated with 0-ohm resistors, and resistors R8, R9, R10, R11, R13, and R41 must be left unpopulated. This allows the user to select settings using the MODE, SLEW, and GAIN pins by using jumpers on J10, J11, and J12. An outline of the various hardware selectable settings can be found below.

Table 4-3. Description of Hardware settings for DRV8311H

Setting	Position	Description
<b>MODE</b>	AVDD	3x PWM Mode
	Hi-Z (DNI)	3x PWM Mode
	47k to GND	6x PWM Mode
	GND	6x PWM Mode
<b>SLEW</b>	AVDD	200 V/μs
	Hi-Z (DNI)	125 V/μs
	47k to GND	50 V/μs
	GND	25 V/μs

**Table 4-3. Description of Hardware settings for DRV8311H (continued)**

Setting	Position	Description
<b>GAIN</b>	AVDD	2 V/A
	Hi-Z (DNI)	1 V/A
	47k to GND	0.5 V/A
	GND	0.25 V/A

#### 4.4.2 DRV8311S Compatibility

The DRV8311HEVM is compatible with the DRV8311S (SPI variant) to spin a 3-phase Brushless-DC motor. The DRV8311S replaces the hardware settings (MODE, SLEW, and GAIN) as well as the nSLEEP setting with 4 SPI signals: SDI, SDO, SCLK, and nSCS.

When using the DRV8311S, resistors R1, R8, R9, R10, and R11 must be populated with 0-ohm resistors, R13 must be populated with a 5.1k ohm resistor, and resistors R12 and R41 must be unpopulated. Additionally, the jumpers must be removed from J10, J11, and J12. This properly connects the SPI signals to the correct pins on the device.

#### 4.4.3 DRV8311P Compatibility

The DRV8311HEVM is compatible with the DRV8311P (tSPI variant) to spin a 3-phase Brushless-DC motor using enhanced Texas Instruments SPI (tSPI). tSPI is a protocol that allows for multiple motor drivers to be controlled via one SPI bus. Each device has a selectable address in hardware and tSPI protocol allows for individual control of each driver through SPI communication from a single microcontroller unit (MCU).

When using the DRV8311P, resistors R8, R9, R10, R12, and R41 must be populated with 0-ohm resistors, R13 must be populated with a 5.1k ohm resistor, and resistors R1 and R11 must be unpopulated. Additionally, the jumpers must be removed from J10, J11, and J12. This properly connects the tSPI signals to the correct pins on the device. In order to set the address of the device, jumpers must be used on J7 and J8 to select AD0 and AD1. This address sets the unique address of the device to allow tSPI to properly communicate with the driver. Up to 4 DRV8311P EVMs can be controlled with a single MCU through the tSPI protocol, but a unique address must be set for each device using J7 and J8 jumpers.

#### 4.4.4 MCU Power Options

The DRV8311HEVM has several options for powering the LAUNCHXL-F280049C or an external MCU. [Table 4-4](#) provides a description of the various MCU power options.

**Table 4-4. MCU power options**

LAUNCHXL-F280049C connections	DRV8311HEVM connections	Result
JP1, JP2, and JP3 are populated	R14 and R7 are populated	MCU is powered both from the USB of the LaunchPad and the 3V3 rail of the EVM's buck regulator.
JP1, JP2, and JP3 are populated	R14 is populated, R7 is not populated, no external 3V3 supplied to EVM	MCU is powered from the USB of the LaunchPad, and the LaunchPad will supply 3V3 to the EVM.
JP1, JP2, and JP3 are populated	R14 is populated, R7 is not populated, external 3V3 supplied to EVM through TP22	MCU is powered both from the USB of the LaunchPad and from the external 3V3 supplied to the EVM
JP1, JP2, and JP3 are populated	R14 is not populated	MCU is powered from USB power supply
JP3 is populated, JP1 and JP2 are not populated	R14 and R7 is populated	MCU is powered completely from the 3V3 of the buck of the EVM
JP3 is populated, JP1 and JP2 are not populated	R14 is populated, R7 is not populated, external 3V3 supplied to EVM through TP22	MCU is powered completely from the external 3V3 supplied to the EVM

#### 4.4.5 Interfacing DRV8311HEVM and LAUNCHXL-F280049C LaunchPad

The DRV8311HEVM has 40 pins with different functions. These pins are interfaced with the LAUNCHXL-F280049C LaunchPad development kit and are mapped appropriately to receive the functionalities of the DRV8311H device. These 40 pins are grouped into 4 ports in respect to the LAUNCHXL-F280049C (J1 to J4). [Table 4-5](#) and [Table 4-6](#) list the interfacing of these ports of the DRV8311HEVM headers J3 and J4.

**Table 4-5. Connections for Header J1 on DRV8311HEVM (DNP in bold)**

J1 Pin Number	DRV8311HEVM Function	LAUNCHXL-F280049C Function	Description
1	3.3 VBK	+3.3 V	3.3 V LaunchPad Supply
2	5 V supply	+5 V	5 V Boost from LaunchPad
3	Not used	PGA1/3/5_GND	Not used
4	AGND	GND	GND connection
5	Not used	GPIO13/SCIBRX	Not used
6	VSENA	ADCINA5	Phase A Voltage Sense
7	HALLC	GPIO40/SCIBTX	Hall sensor C from motor
8	VSENB	ADCINB0	Phase B Voltage Sense
9	<b>nSLEEP (DNP)</b>	NC	For internal use only
10	VSENC	ADCINC2	Phase C Voltage Sense
11	Not used	ADCINB3/VDAC	Not used
12	VSENVN	ADCINB1	VM Bus Voltage Sense
13	SCLK	SPIACLK	SPI Clock (DRV8311S and DRV8311P only)
14	ISENA	ADCINB2	Phase A low side Current Sense
15	<b>nFAULT (DNP)</b>	ADCINC4	For internal use only
16	ISENB	ADCINC0	Phase B low side Current Sense
17	nSLEEP	GPIO37	Active-low input to sleep pin
18	ISENC	ADCINA9	Phase C low side Current Sense
19	nFAULT	GPIO35	Active-low output from fault pin
20	C_TAP	ADCINA1	ADC for Center Tap sensing

**Table 4-6. Connections for Header J2 on DRV8311HEVM**

J2 Pin Number	DRV8311HEVM Function	LAUNCHXL-F280049C Function	Description
1	INHA	GPIO10/PWM6A	PWM used to switch High-side FET of Phase A (DRV8311H and DRV8311S only)
2	AGND	GND	GND connection
3	INLA	GPIO11/PWM6B	PWM used to switch Low-side FET of Phase A (DRV8311H and DRV8311S only)
4	nSCS	SPIASTE	SPI active-low chip select (DRV8311S only)
5	INHB	GPIO8/PWM5A	PWM used to switch High-side FET of Phase B (DRV8311H and DRV8311S only)
6	Not used	NC	Not used

**Table 4-6. Connections for Header J2 on DRV8311HEVM (continued)**

J2 Pin Number	DRV8311HEVM Function	LAUNCHXL-F280049C Function	Description
7	INLB/PWM_SYNC	GPIO9/PWM5B	PWM used to switch Low-side FET of Phase B (DRV8311H and DRV8311S), or PWM used to synchronize PWM signals with MCU (DRV8311P)
8	Not used	NC	Not used
9	INHC	GPIO4/PWM3A	PWM used to switch High-side FET of Phase (DRV8311H and DRV8311S only)
10	Not used	XRSn	Not used
11	INLC	GPIO5/PWM3B	PWM used to switch Low-side FET of Phase C (DRV8311H and DRV8311S only)
12	SDI	SPIASIMO	SPI data input (DRV8311S and DRV8311P only)
13	HALLA	GPIO58	HALL sensor A from motor
14	SDO	SPIASOMI	SPI data output (DRV8311S and DRV8311P only)
15	HALLB	GPIO30	HALL sensor B from motor
16	Not used	GPIO39	Not used
17	Not used	GPIO18/XCLKOUT (not connected)	Not used
18	Not used	GPIO23/LED4	LED reserved on LaunchPad
19	<b>CSA_REF (DNP)</b>	GPIO25	For internal use only
20	MCU_LED	GPIO59	Visual feedback for LaunchPad connection

## 5 Hardware Setup

The hardware required to run the motor control is the LAUNCHXL-F280049C LaunchPad development kit, the DRV8311HEVM, a Micro-USB cable, and a power supply with a DC output from 3-V to 20-V. Follow these steps to set up the evaluation module:

1) Ensure all resistors or jumpers are set up accordingly according to the device variant used. The DRV8311HEVM by default is populated with and configured for the DRV8311H (hardware variant). If using the DRV8311S or DRV8311P, please follow row J of [Table 4-2](#) to configure the board for the DRV8311x device variant populated for U1.

2) Mate the DRV8311HEVM board to the top half of the LAUNCHXL-F280049C LaunchPad development kit (mates to J1/J3 and J2/J4 of LaunchPad, as in [Figure 4-3](#)).

**NOTE:** Observe the correct orientation when placing DRV8311HEVM to the LAUNCHXL-F280049C. The motor and power connectors should face to the LaunchPad's Micro-USB connector.

3) Connect the three phases from the brushless-DC motor to the 3-pin connector J9 on DRV8311HEVM. Phases OUTA, OUTB, and OUTC are labeled in white silkscreen on the PCB top layer.

**NOTE:** If using a sensed algorithm on the LaunchPad development kit, connect Hall sensors to the 5-pin connector J4.

4) Connect the DC power supply to header J5.

**NOTE:** Observe the correct polarity VM and GND connections on the DRV8311HEVM connector J3.

5) Connect a Micro-USB cable to the LaunchPad development kit and computer.

6) Turn on the power supply and power up the PCB.

If using the DRV8311HEVM with an external microcontroller, make the connections needed on the male headers on the top of the board or female connectors on the bottom side of the board.

## 6 Firmware and GUI Application

The DRV8311HEVM can implement sensed, sensorless, or Field-oriented control for commutating a 3-phase Brushless-DC motor. The supported firmware is a sensorless Field-oriented control algorithm adapted from Texas Instruments' [MotorControl SDK](#) Library of motor solutions. The firmware includes motor identification and a sensorless FOC algorithm to spin the motor. The firmware uses the DRV8311HEVM InstaSPIN Universal GUI to run the algorithm and includes tabs to read from and write to the DRV8311 SPI registers (DRV8311S only).

The steps below will describe how to identify useful motor parameters, spin the motor, and work with the DRV8311S SPI registers. For more information on more advanced features of the C2000 InstaSPIN Universal GUI such as torque and speed control, MTPA, or Field-weakening, consult the MotorControl SDK InstaSPIN Lab Guide (in the [MotorControl Software Development Kit tool page](#)) and [InstaSPIN-FOC and InstaSPIN-MOTION User's Guide](#).

### 6.1 C2000 InstaSPIN Universal GUI

1. Follow the instructions in [Section 5](#) and ensure the LAUNCHXL-F280049C is connected to the PC and the power supply is turned on to the DRV8311HEVM PCB.
2. Search for the *GUI Composer Gallery* through <https://dev.ti.com/gallery/search/drv8311xevm>. You will to login with a myTI account in order to access the GUI.
3. Accept the readme as shown in [Figure 6-1](#) and check the bottom left hand corner of the screen for "Hardware Connected". Once connected, the GUI will flash the algorithm to the MCU as shown in [Figure 6-2](#).

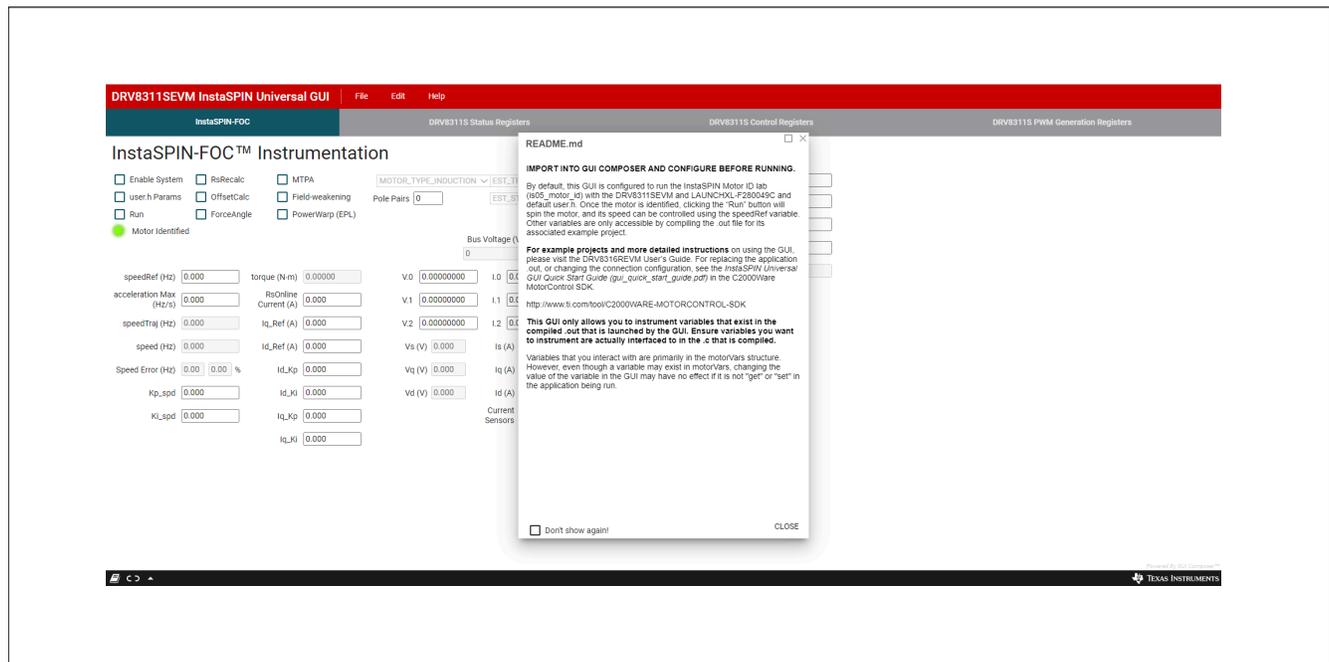
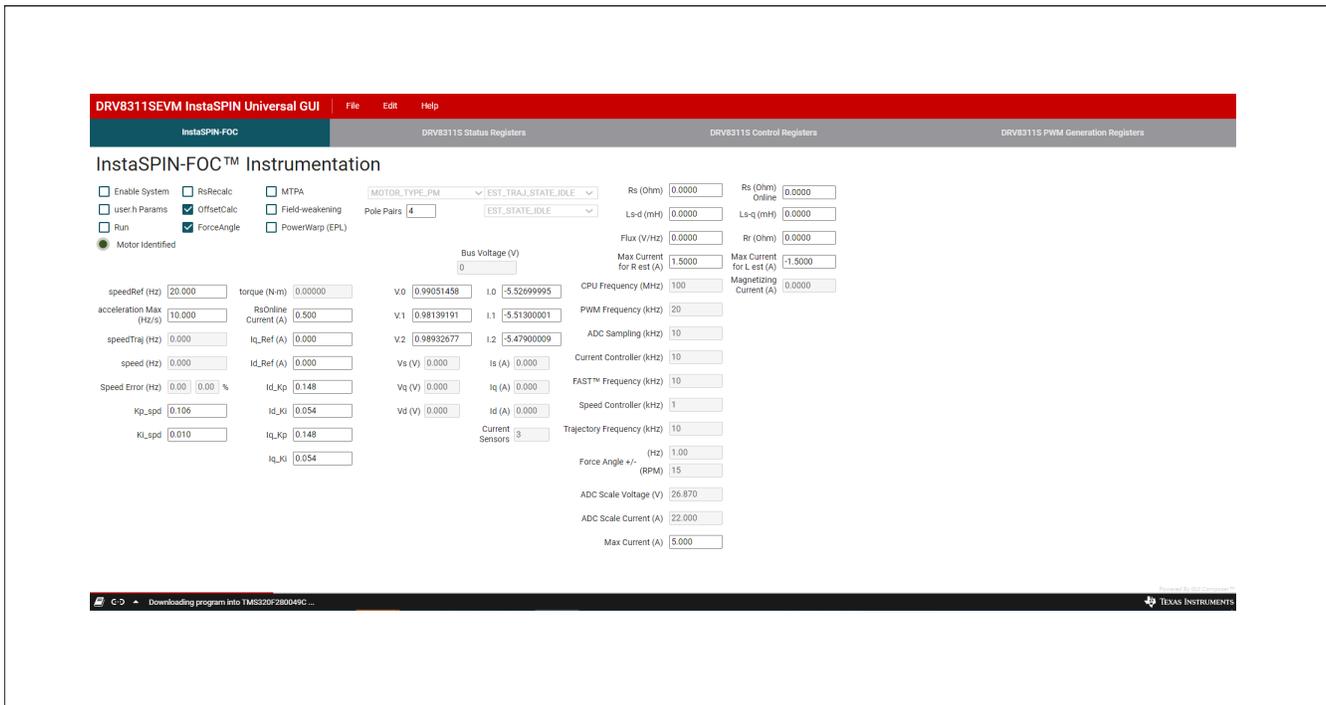


Figure 6-1. C2000 InstaSPIN Universal GUI Readme



**Figure 6-2. C2000 InstaSPIN Universal GUI Downloading Program**

## 6.2 Motor Identification

1. Check the “Enable System” box to enable the InstaSPIN algorithm and run preset calibrations. Wait for the “OffsetCalc” button to uncheck automatically to finish calibrating board offsets.
2. Check the “Run” box to begin the motor identification algorithm as shown in [Figure 6-3](#). The motor will begin to spin and stop as it goes through many states to calculate and identify useful motor parameters for sensorless Field-oriented control. This should take no more than a couple of minutes.
3. Once the motor identification process is complete, the “Motor Identified” indicator will light up, the “Run” box will be automatically unchecked, and the values  $R_s$ ,  $R_s$  Online,  $L_s$ -d,  $L_s$ -q, Flux, and  $R_r$  will update for that motor as shown in [Figure 6-4](#). These values will be automatically used for Field-oriented control.

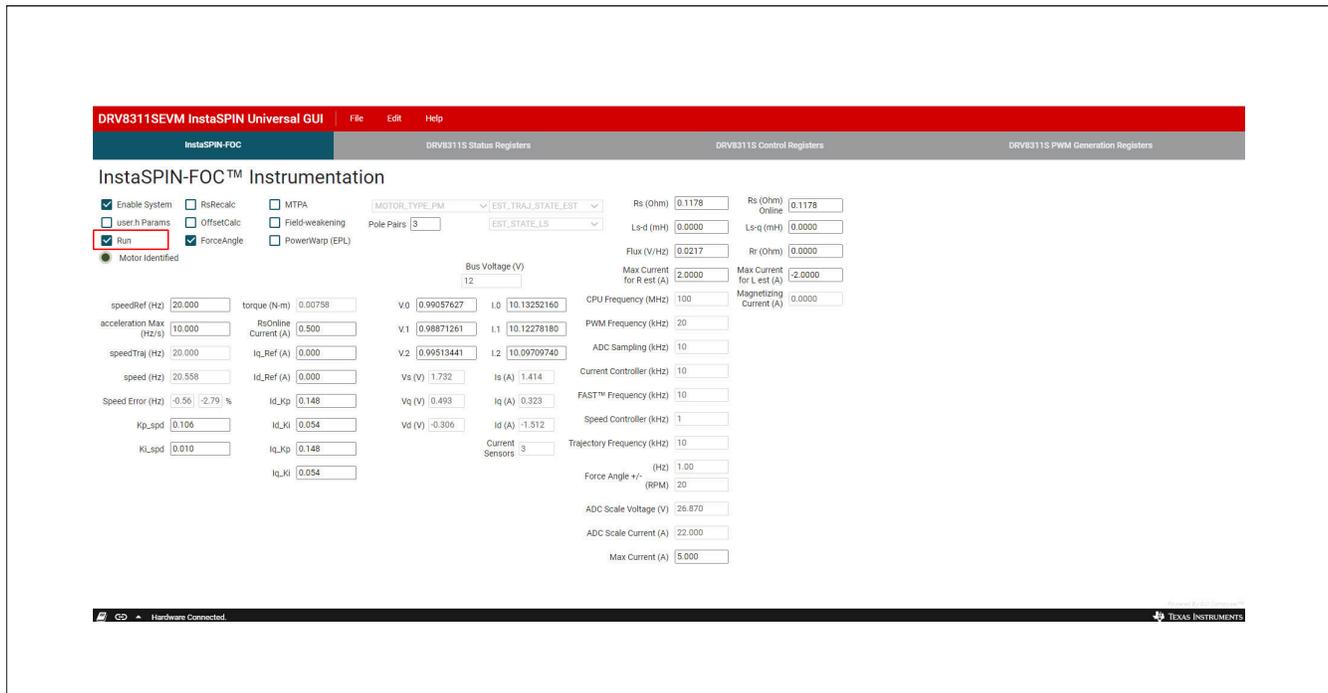


Figure 6-3. C2000 InstaSPIN Universal GUI Running motor identification

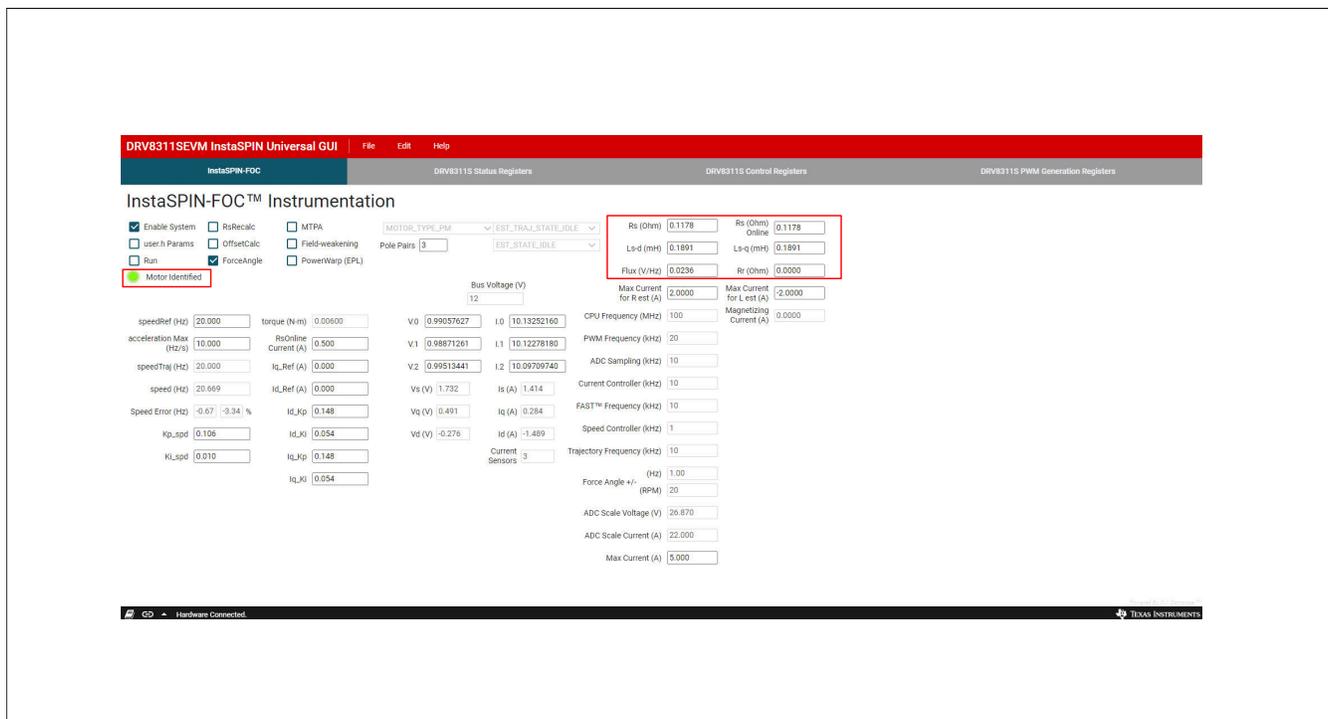
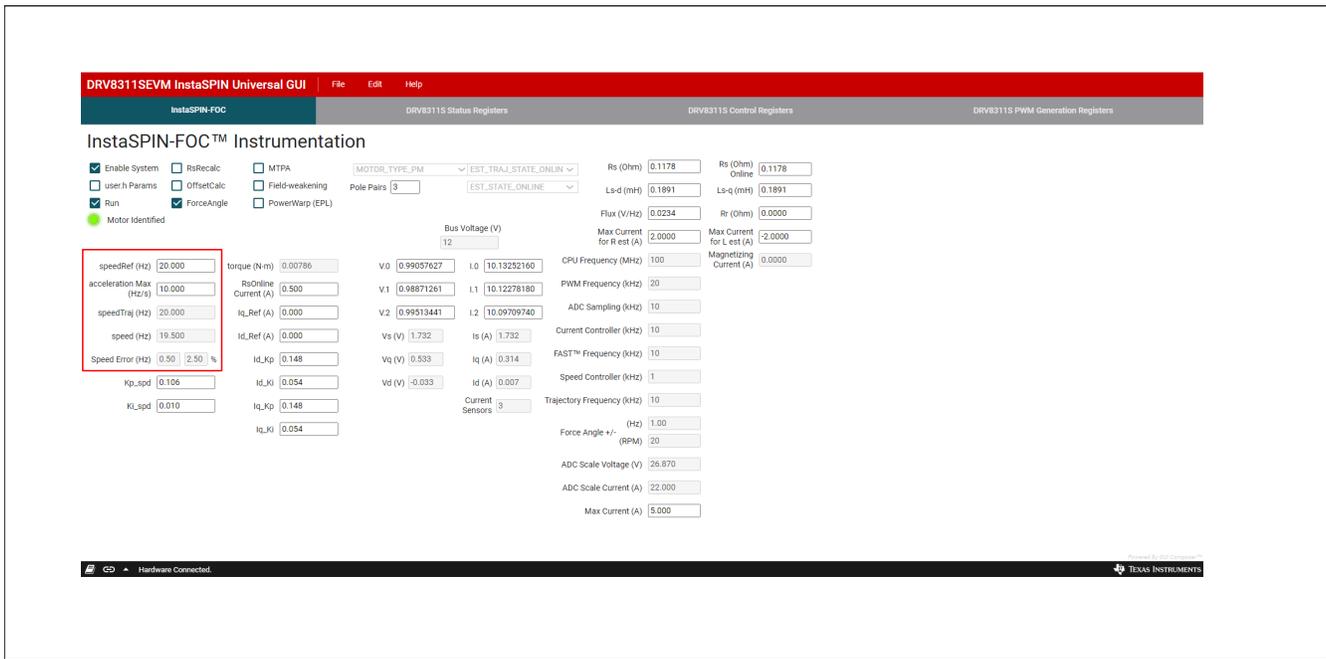


Figure 6-4. Motor identification complete using the DRV8311HEVM InstaSPIN GUI

### 6.3 Sensorless-FOC Commutation

1. To spin the motor with sensorless FOC, check the “Run” box again. The motor will spin with sinusoidal current at the speedRef (Hz) value in the GUI, which is automatically set to 20.0 Hz. Use the speedRef (Hz) input to change the current speed of the motor as shown in Figure 6-5. The GUI automatically calculates the current reference speed using the variable speed (Hz) and compares it to the trajectory speed variable speedTraj (Hz) to calculate the Speed Error (Hz) and as a percentage.



**Figure 6-5. Sensorless-FOC commutation using the DRV8311HEVM InstaSPIN GUI**

### 6.4 Torque Control, Speed Control, and Advanced Modulation Techniques

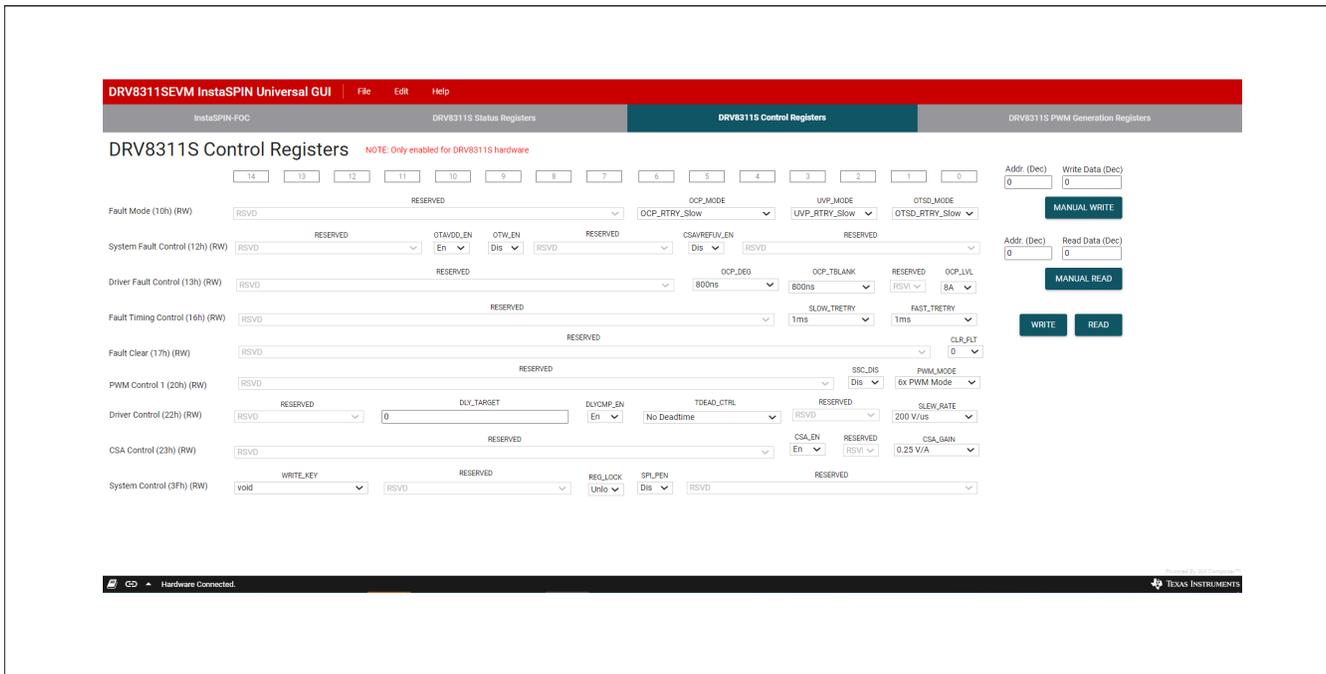
To implement more advanced modulation techniques such as torque control, speed control, and algorithms such as MTPA, Field-weakening, and PowerWarp (EPL) using the DRV8311HEVM InstaSPIN Universal GUI, please consult the MotorControl SDK InstaSPIN Lab Guide found in MotorControl SDK.

This document contains detailed lab overviews of how to implement each advanced modulation technique when using sensorless FOC to spin the BLDC motor in Code Composer Studio. In order to use the project with the GUI, the user must build and compile the project in CCS, and import the .out binary file for that project into the GUI properties through GUI Composer. More information can be found in the README when the GUI is first opened.

### 6.5 SPI Communication (DRV8311S only)

The DRV8311HEVM InstaSPIN\_Universal\_GUI includes three SPI register tabs for the DRV8311S: Status Registers, Control Registers, and PWM Generation Registers. For InstaSPIN-FOC, only the Status and Control Registers will be used since internal PWM generation is not a supported use case for InstaSPIN-FOC for the DRV8311H and DRV8311S.

1. Click on the “DRV8311S Control Registers” tab to access the DRV8311S Control Registers as shown in [Figure 6-6](#).
2. Choose the desired settings by selecting from the drop-down menus for each setting. Clicking a setting description selects the bits required for that control register setting. Consult the [DRV8311 datasheet](#) (Section 8.6 Register Map) for detailed definitions of settings.
3. Click on “Write” to write to all control registers in the device with the configured settings.
4. To read all status and control registers in the device, click on “Read”. The statuses and settings will auto-populate in the DRV8311S Status Registers and Control Registers.
5. Alternatively, to write data to a specific address, input the address and data in decimal into the address and data inputs above the “Manual Write” box. Click on the “Manual Write” box to write the data to that address. To read data from a specific address, input the address in decimal into the address above the “Manual Read” box. Click on the “Manual Write” box to read the data from that address.



**Figure 6-6. DRV8311HEVM InstaSPIN GUI SPI Control Registers**

## 7 Schematics

### 7.1 Main Supply / Status LEDs

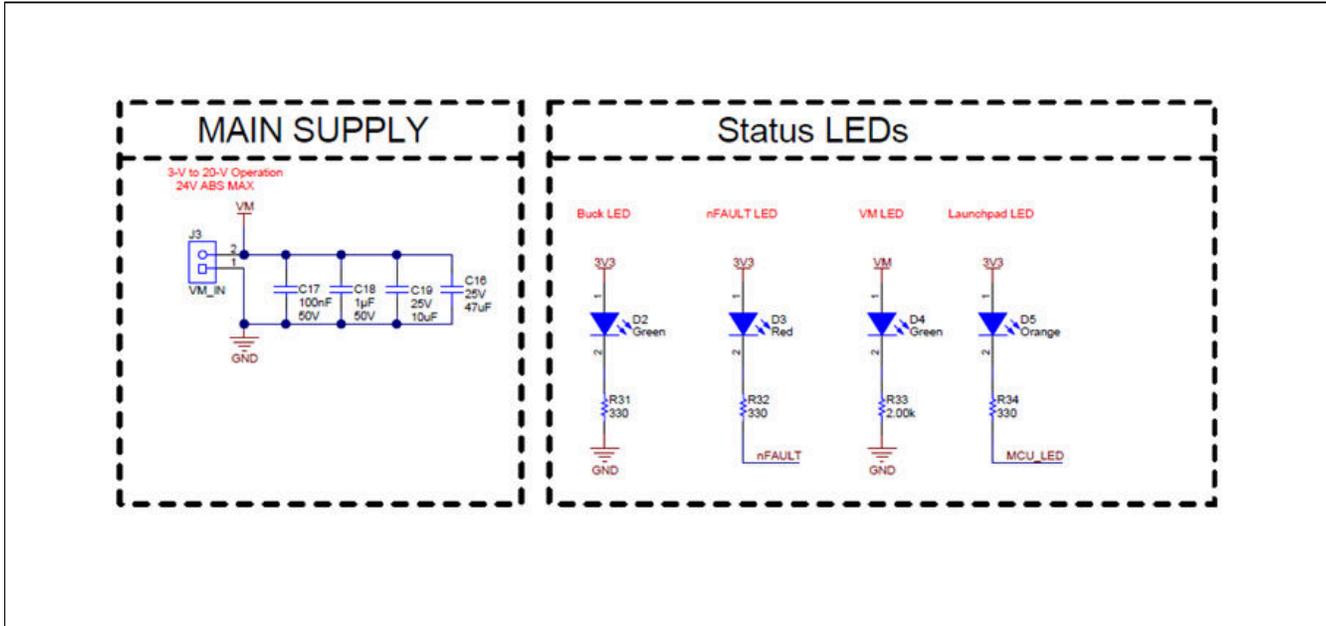


Figure 7-1. Main Supply / Status LEDs schematic

### 7.2 DRV8311H/S/P

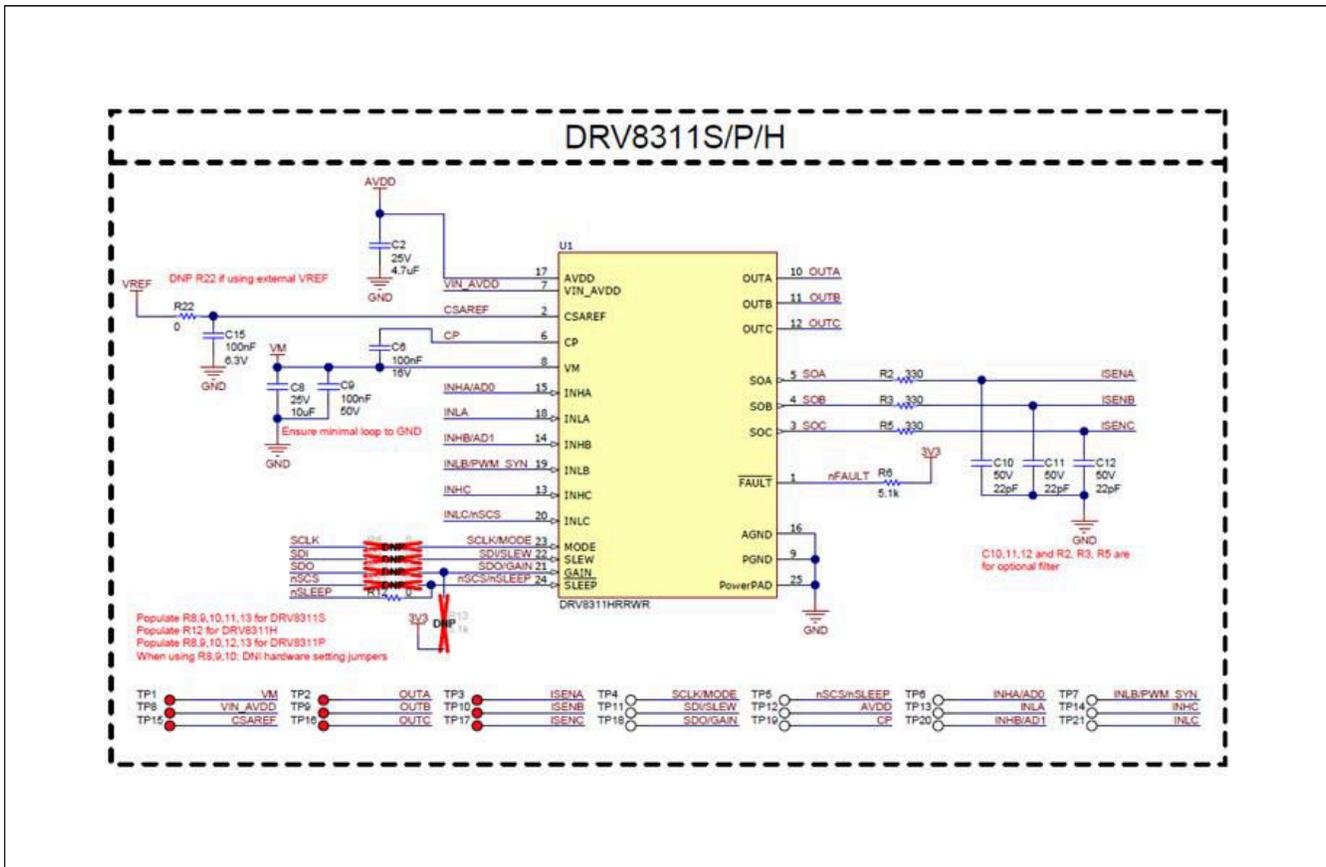


Figure 7-2. DRV8311H/S/P schematic

### 7.3 3.3V Buck Regulator

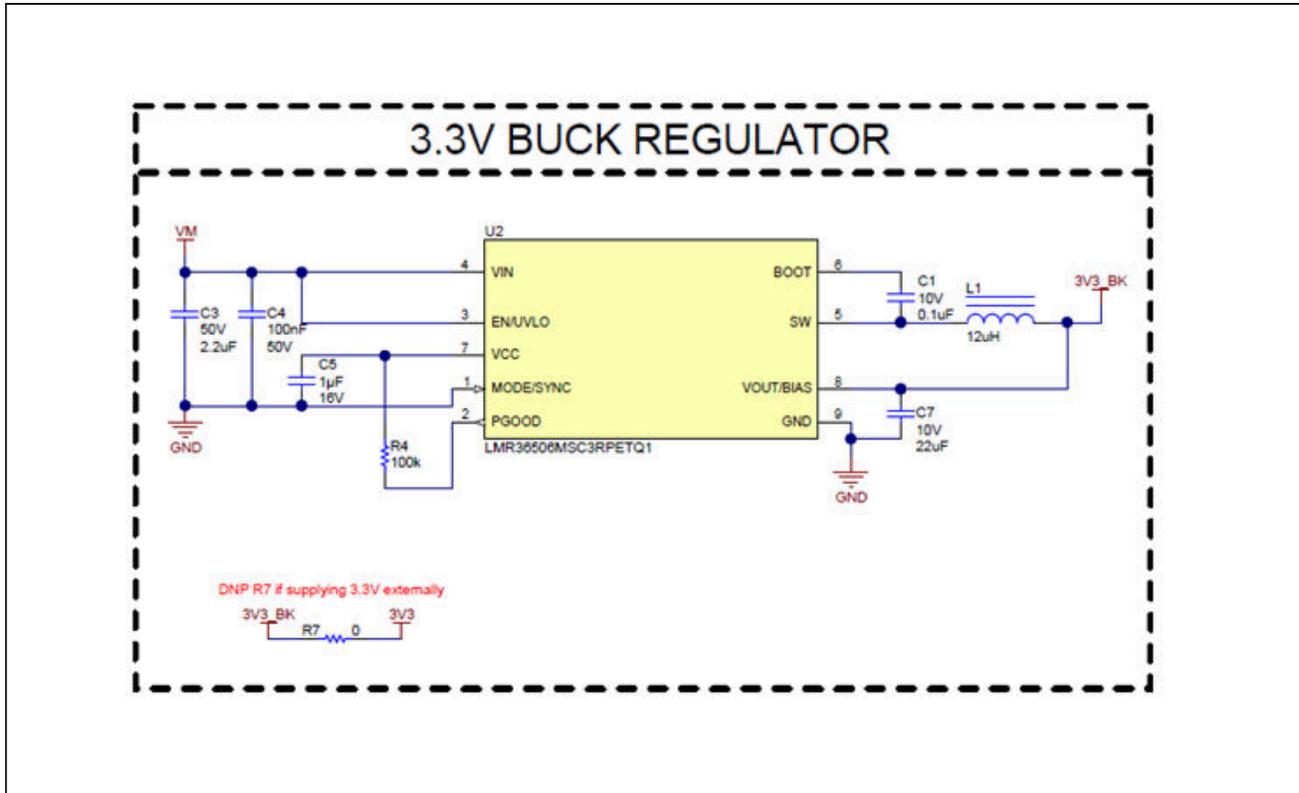


Figure 7-3. 3.3V Buck Regulator schematic

## 7.4 Voltage Reference

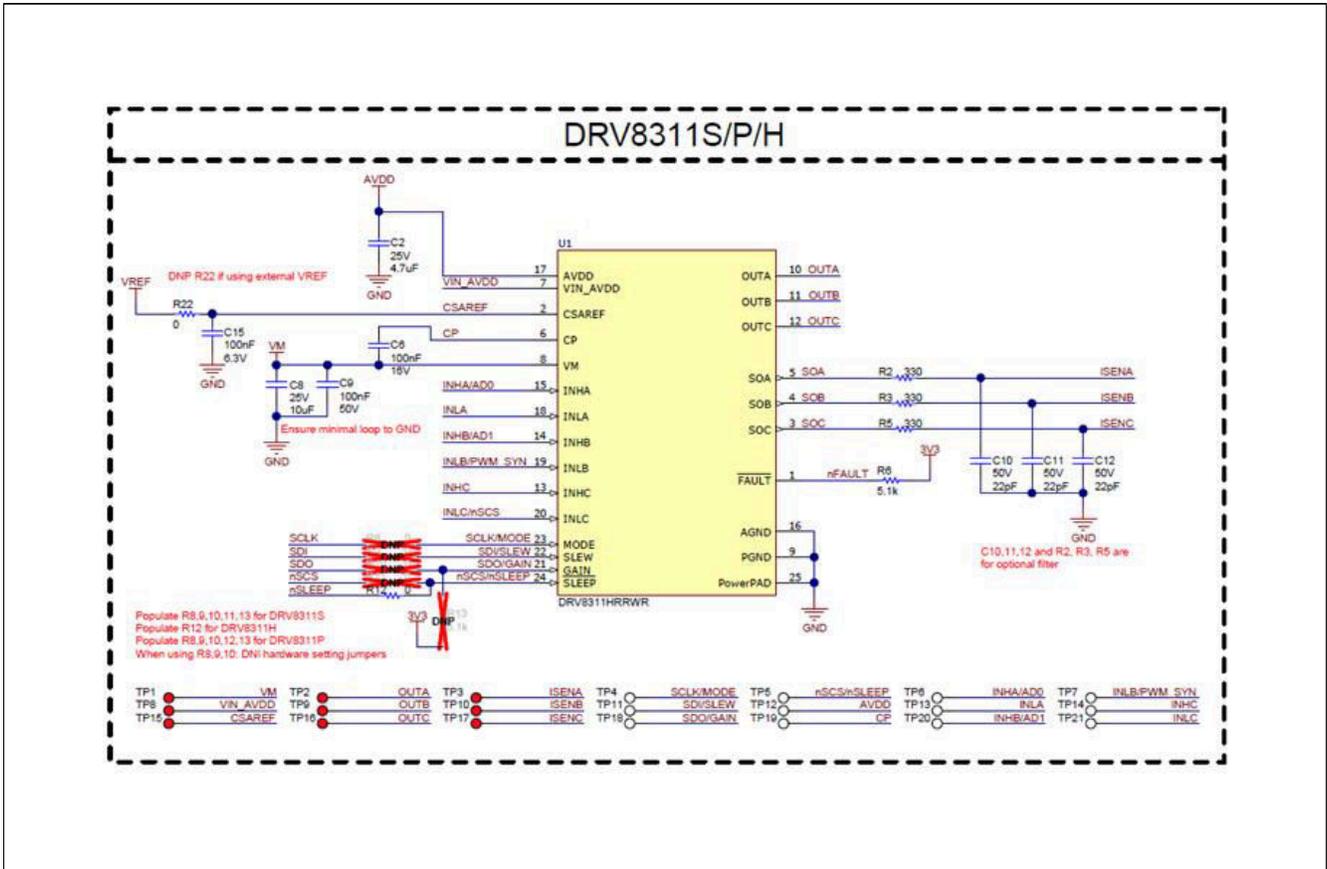


Figure 7-4. Voltage Reference schematic

## 7.5 LaunchPad Connections

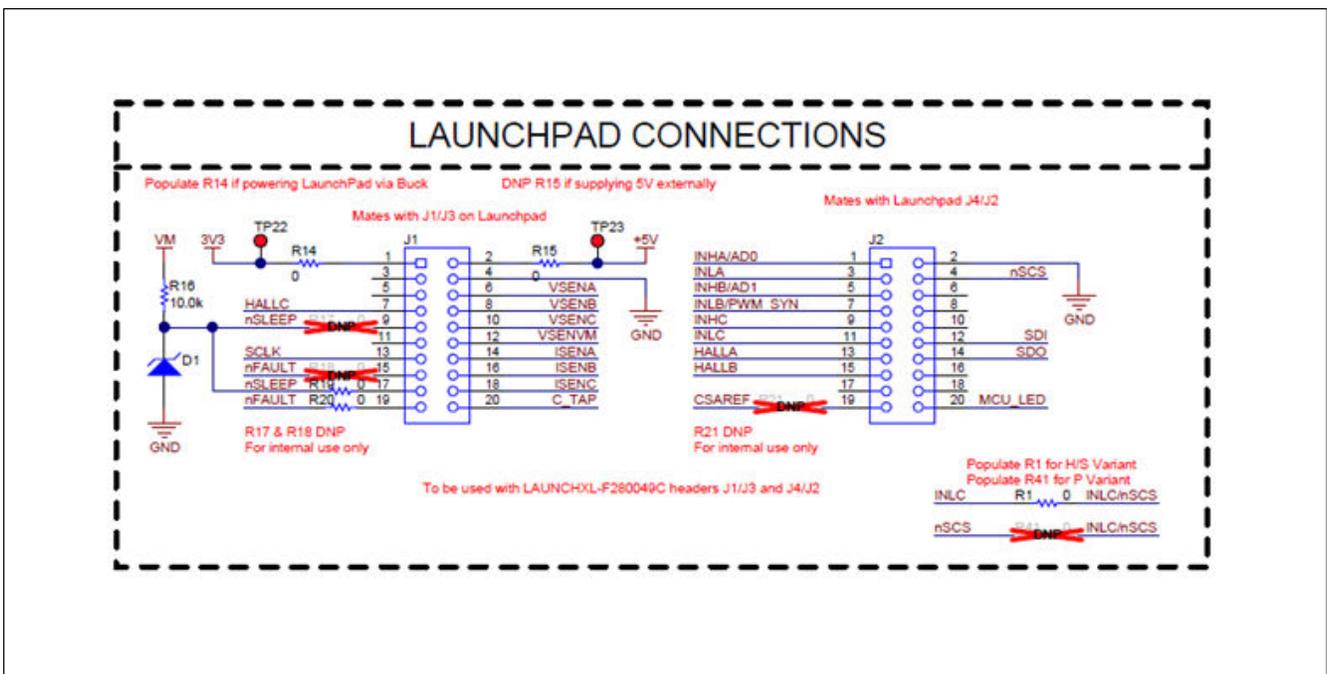


Figure 7-5. LaunchPad Connections schematic

## 7.6 Connectors & Interface

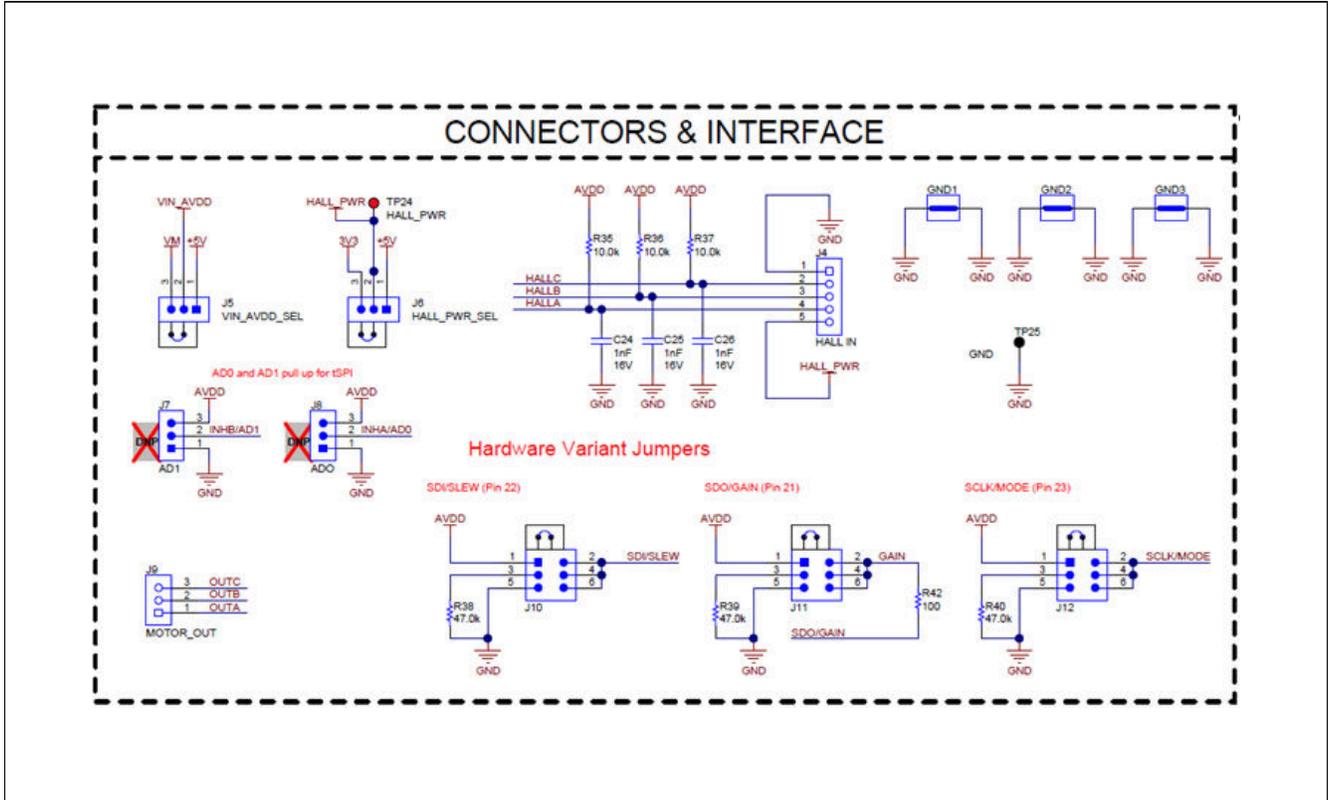


Figure 7-6. Connectors & Interface schematic

## 7.7 Voltage Sense & Protection

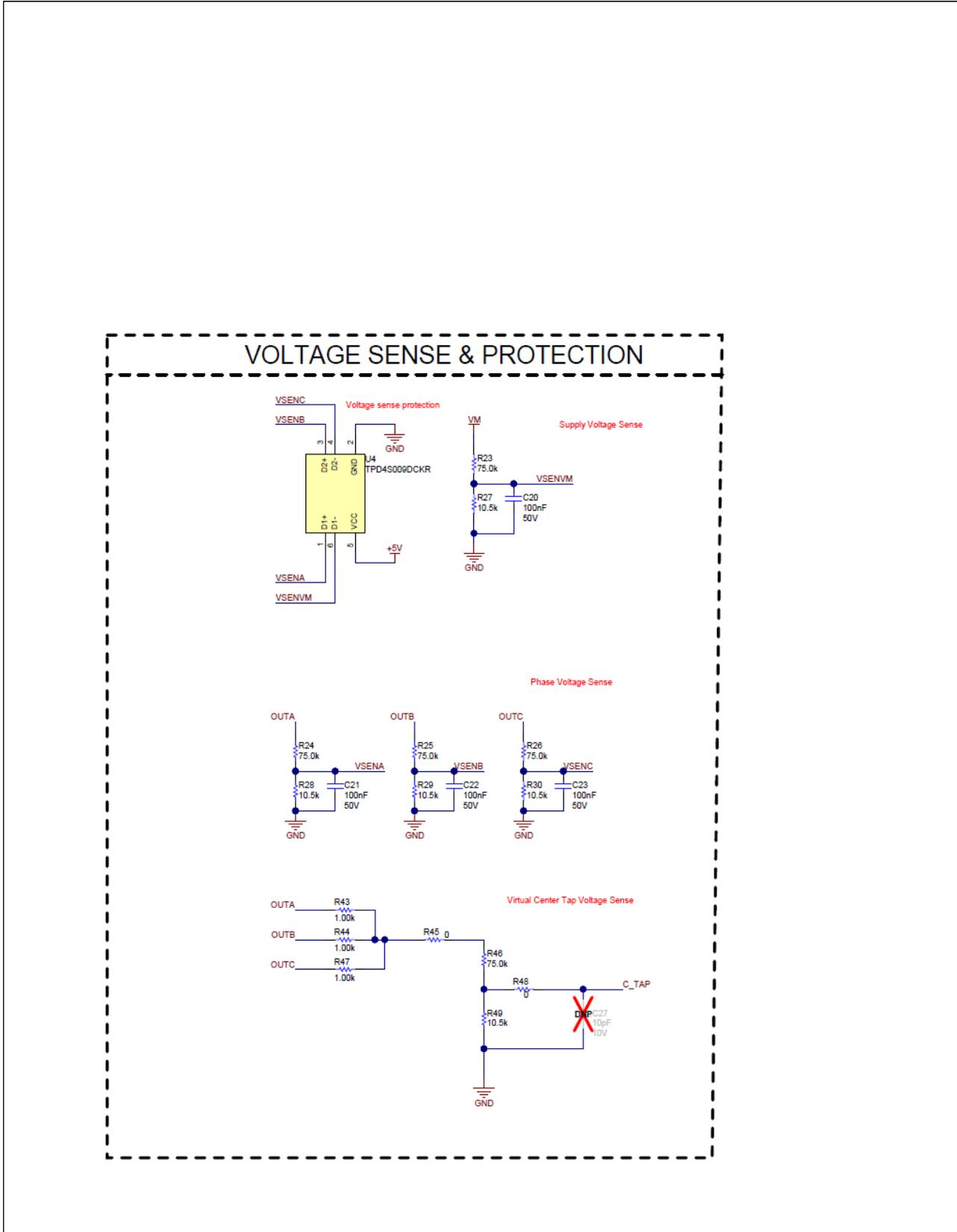


Figure 7-7. Voltage Sense & Protection schematic

## 8 Revision History

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

DATE	REVISION	NOTES
August 2021	*	Initial Release

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