User's Guide

DRV8328xEVM User's Guide

ABSTRACT

This document is provided with the DRV8328 customer evaluation module (EVM) as a supplement to the DRV8328x data sheet (DRV8328 4.5-V to 60-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.

Note

The DRV8328AEVM comes automatically populated with and configured for the DRV8328A. It is also compatible for the DRV8328B, DRV8328C, and DRV8328D variants (see Section 3.4.1 and Section 3.4.2), but the user will need to modify the board to make it compatible for each variant (see Table 3-3 and Table 3-4).

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1 Introduction

The DRV8328 is a 4.5-V to 60-V triple half-bridge gate driver IC for motor drive applications. The DRV8328 provides a bootstrap architecture to drive 3 high-side and 3 low-side N-channel MOSFETs with up to 1-A peak source and 2-A peak sink current. The DRV8328 can also support up to 100% PWM duty cycle inputs with an integrated trickle charge pump. All variants are in compact QFN packages with hardware configurations and provide ultra-low sleep mode current. Additionally, variants offer a variety of optional features including a dead time pin, overcurrent level pin, driver shutoff pin, and integrated LDO capable of driving 3.3 V and 80 mA. A summary of the variants below can be seen in Table 1-1.

Table 1-1. DRV8328 device variant names and descriptions (default of EVM in bold)

Device Name	LDO Output	DT pin and VDSLVL pin	PWM Mode
DRV8328A	**N/A**	**Available**	**6x PWM**
DRV8328B	N/A	Available	3x PWM
DRV8328C	3.3 V	N/A	6x PWM
DRV8328D	3.3 V	N/A	3x PWM

The DRV8328AEVM can be interfaced with the TMS320F280049C microcontroller on the LAUNCHXL-F280049C LaunchPad in correspondence with the reference software to provide the algorithm to the DRV8328 to control the BLDC motor.

This document serves as a startup guide to supplement the DRV8328AEVM + 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 DRV8328. For step by step details on connecting the LAUNCHXL-F280049C + DRV8328AEVM, refer to Section 4.

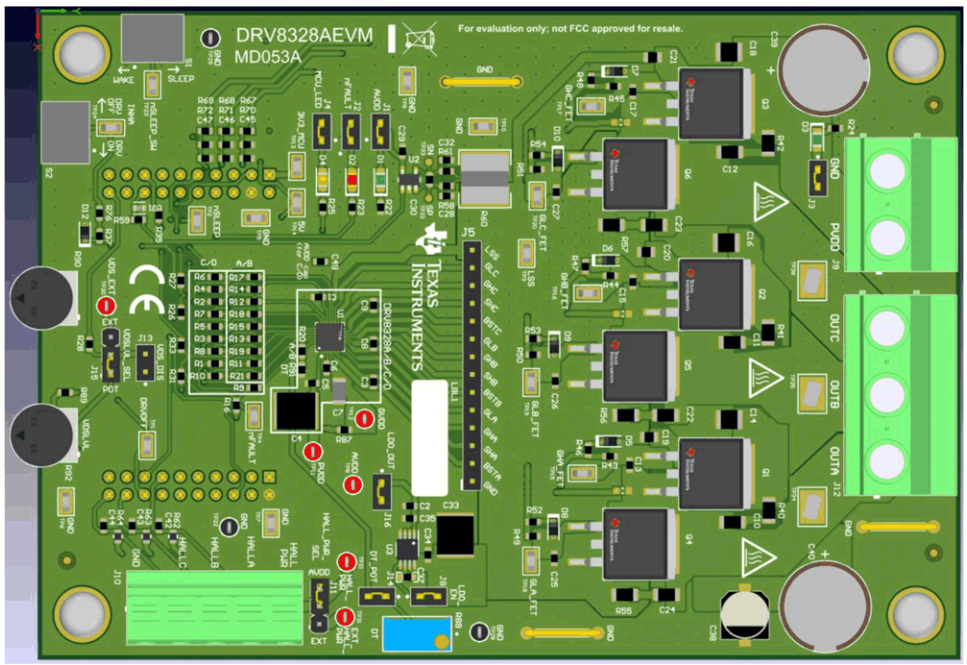

Figure 1-1. DRV8328AEVM PCB Layout

2 Quick Start Guide

The DRV8328AEVM requires a power supply with a recommended operating range from 4.5-V to 60-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 J9 and the power supply positive terminal to the PVDD pin of J9. Ensure jumpers JP1, JP2, and JP3 of the LAUNCHXL-F280049C are not populated (DNP) to ensure that the LaunchPad is powered by the DRV8328AEVM and the motor supply is isolated from the USB.
2. Connect the motor phases to OUTA, OUTB, and OUTC in the correct order to connector J12. For sensored applications, connect the Hall sensors to the appropriate locations on the 5-pin connector J10 as shown in Figure 3-2. Select AVDD or EXT on jumper J11 to choose the Hall power source voltage.
3. Mate the DRV8328AEVM onto the top half of the LAUNCHXL-F280049C (LaunchPad Headers J1/J3 and J2/J4) as shown in Figure 3-3. The motor and power connectors should face the same direction as the Micro-USB connector on the LaunchPad.
4. Remove R26 if toggling nSLEEP from switch on board. Place nSLEEP switch in WAKE position.
5. Power on the DRV8328AEVM.
6. Connect a Micro-USB cable from the computer into the Micro USB connector on the top of the LAUNCHXL-F280049C as shown in Figure 3-3.

3 Hardware and Software Overview

3.1 Hardware Connections Overview – DRV8328AEVM + LAUNCHXL-F280049C

Figure 3-1 shows the major hardware blocks of the DRV8328AEVM. The DRV8328AEVM is designed for an input supply from 4.5-V to 60-V.

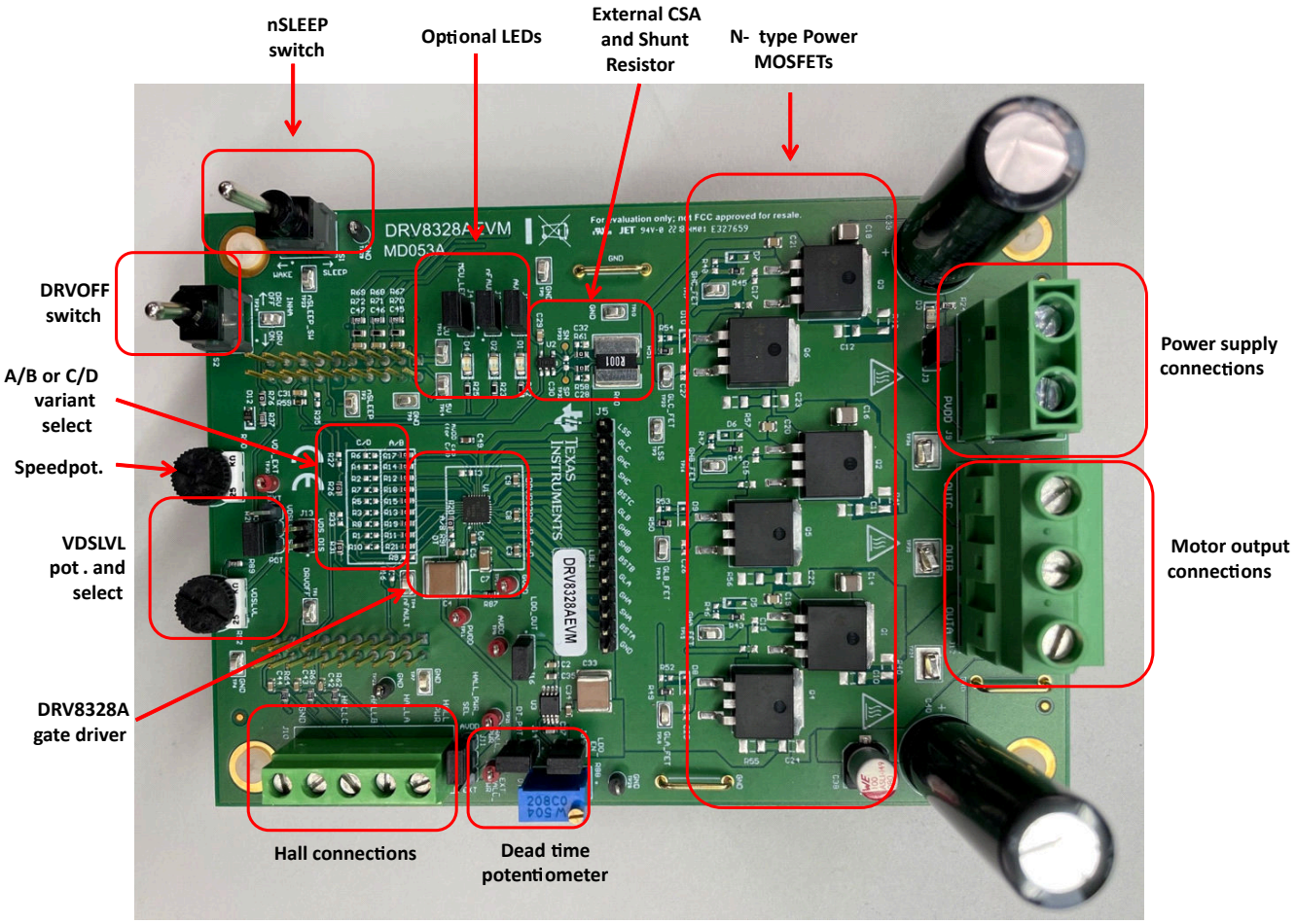

Figure 3-1. Major hardware blocks of the DRV8328AEVM

3.2 Connection Details

Figure 3-2 shows the power supply and motor connections made to the DRV8328AEVM in order to spin a 3-phase sensored or sensorless Brushless-DC motor.

A 4.5-V to 60-V power supply or battery is connected to the PVDD and GND terminals. The three phases of the BLDC motor connect directly to the OUTA, OUTB, and OUTC terminals of the screw terminal J12 provided on the DRV8328AEVM.

For sensored applications, to connect the Hall sensor outputs to the Hall connectors on the DRV8328AEVM, push down on the respective terminals to open the sockets and insert the Hall sensor wires into connector J10.

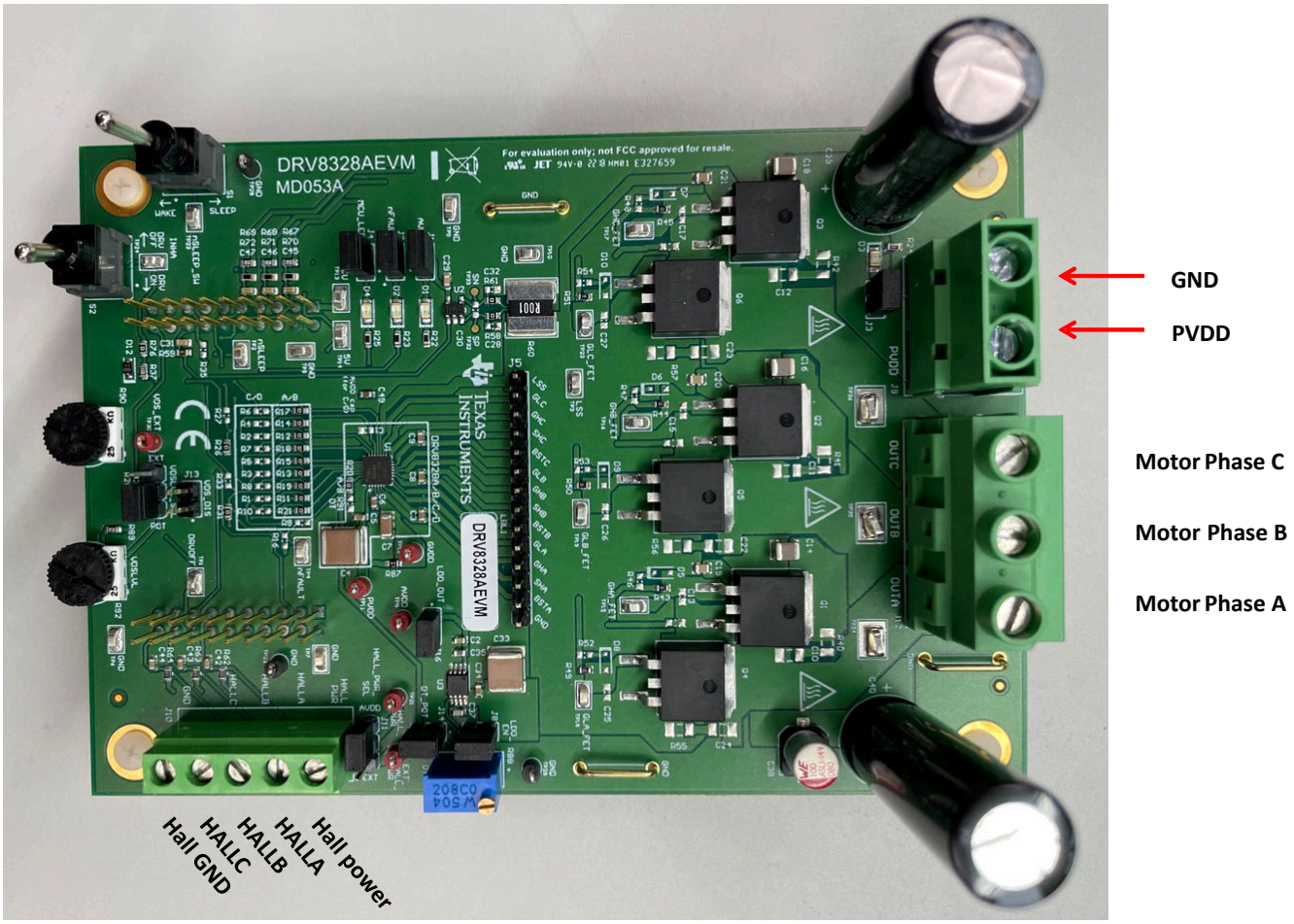

Figure 3-2. Connections from motor to DRV8328AEVM

Figure 3-3 and Figure 3-4 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 DRV8328AEVM to the J1/J3 and J2/J4 headers of the LaunchPad.

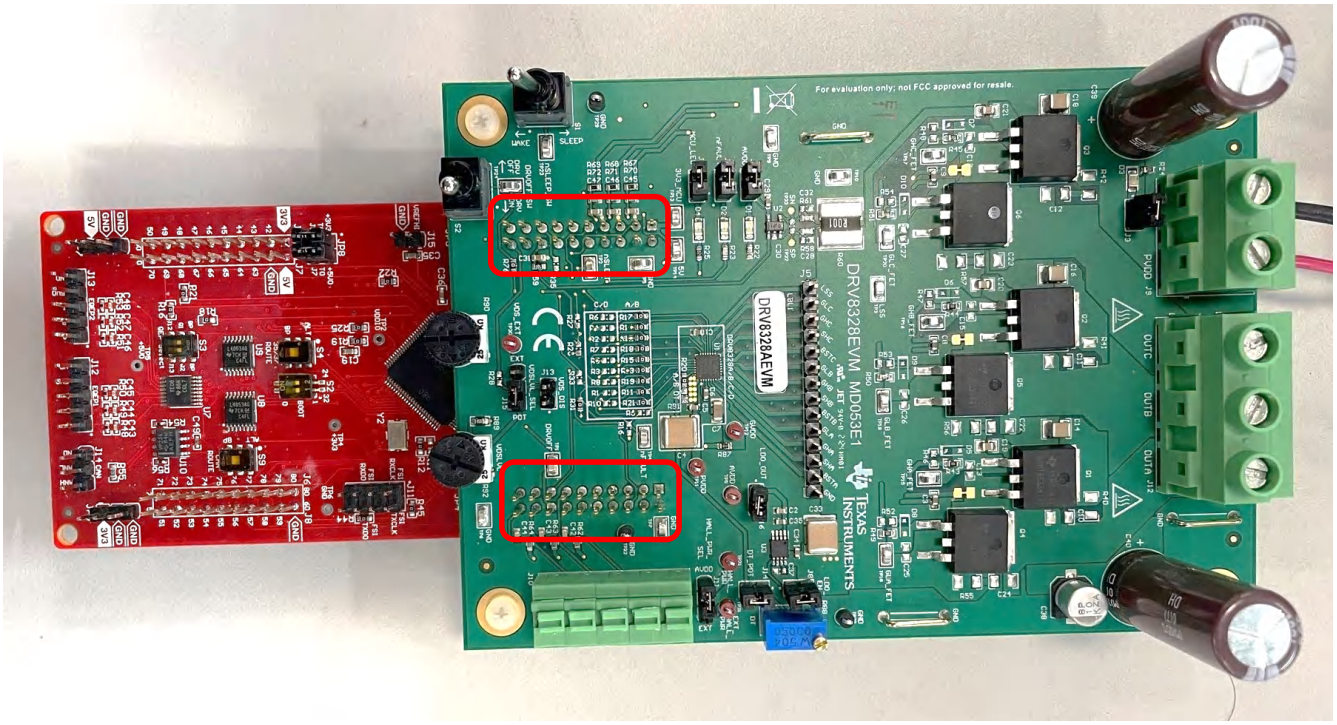

Figure 3-3. DRV8328AEVM on headers J1/J3 and J2/J4 of LaunchPad

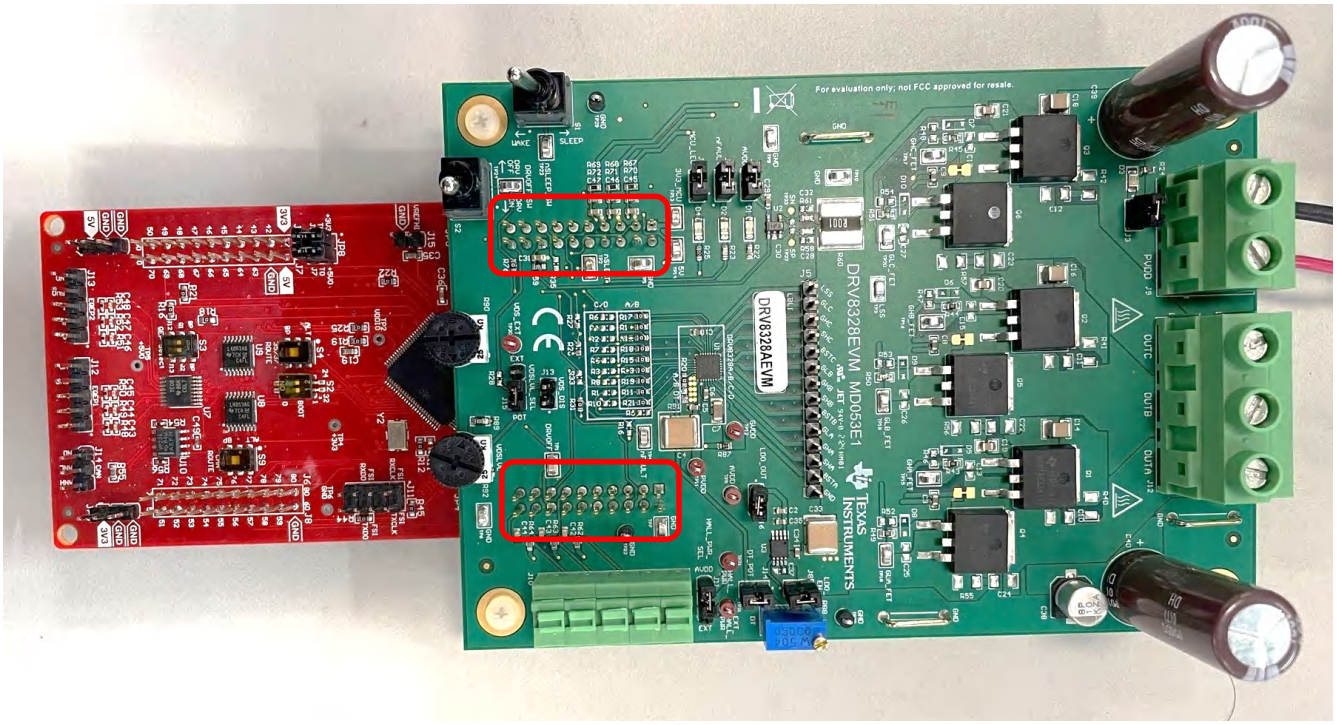

Figure 3-4. Micro-USB plugged into LaunchPad

3.3 LED Lights

There are LED indicators on both the LAUNCHXL-F280049C and DRV8328AEVM when power is provided and the micro USB cable is plugged in to the LaunchPad.

The DRV8328AEVM has 4 status LEDs on the board. By default, the PVDD and AVDD 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 3-1 shows the LED descriptions, with the LEDs that

are on during power up indicated in bold. Figure 3-5 shows the LED locations on the EVM. These LEDs all have removable jumpers to reduce power consumed by the EVM.

Table 3-1. Description of DRV8328AEVM LEDs (on during power up in bold)

Designator	Jumper	Name	Color	Description
D1	**J1**	**3V3**	**Green**	**AVDD is outputting 3.3 V**
D2	J2	nFAULT	Red	Lights up when fault condition has occurred on DRV8328
D3	**J3**	**PVDD**	**Green**	**Power is supplied to the board**
D4	J4	MCU_LED	Orange	MCU debugging

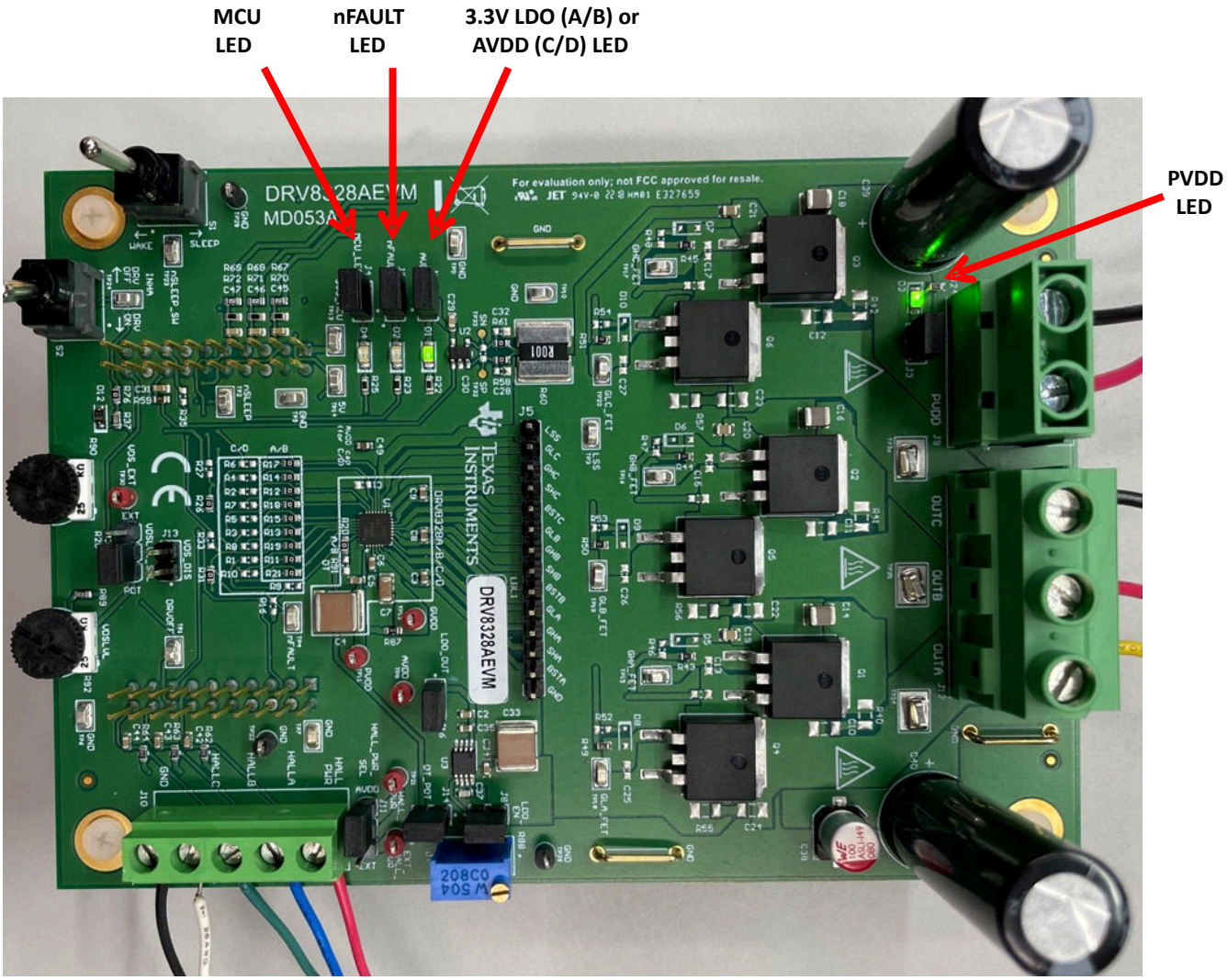

Figure 3-5. DRV8328AEVM LEDs

3.4 DRV8328AEVM Configurability and Switch Functions

The DRV8328AEVM includes a variety of user-selectable jumpers and unpopulated components on the PCB to choose user settings and evaluate the DRV8328A, DRV8328B, DRV8328C, or DRV8328D device. A summary of those selectable settings is listed in Table 3-2 (defaults in bold) and can be seen on the board in Figure 3-6.

Section 3.4.1 and Section 3.4.2 describes the changes that need to be made to the board in order to use the variants of the DRV8328 device.

Table 3-2. Description of user selectable settings on DRV8328AEVM

Id.	Setting Name	Description	Position	Function
A	nSLEEP switch	Places DRV8328 in sleep mode	S1 = Right	Sleep mode
			S1 = Left	Operating mode
B	External CSA output filter	RC output filter to suppress high frequency transients of CSA output from current shunt.	R59 = 56 ohms, C31 = 2200 pF	Fc ~1 MHz
C	Power stage MOSFETs and passive components	Optional passive components for tuning power stage, for example series gate resistors, RC snubbers, PVDD-GND capacitors, PVDD-LSS capacitors	R43, R44, R45, R49, R50, R51 = 10 ohm	Series gate resistors (GHA, GHB, GHC, GLA, GLB, GLC)
			R40/C10, R41/C11, R42/C12, R55/C24, R56/C22, R57/C23	RC snubbers (HS FET A, HS FET B, HS FET C, LS FET A, LS FET B, LS FET C)
			C14, C16, C18 = 2.2 uF	**PVDD-VDRAIN bypass capacitor**
			C19, C20, C21 = 0.01 uF	**PVDD-LSS bypass capacitors**
D	LDO jumpers	Jumpers to enable the external LDO and disable the LDO output. Remove jumpers if DRV8328C/D is used.	**J8 = Populated**	**LDO is enabled**
			J8 = DNP	LDO is disabled
			J16 = Populated	**LDO outputs 3.3 V**
			J16 = DNP	LDO output removed
E	Dead time potentiometer, jumper, & resistor	Jumper to enable dead time control from potentiometer and potentiometer used to set the resistance for DT pin (DRV8328A/B only).	**J14 = Populated**	**DT from pot is enabled**
			J14 = DNP	DT from pot is disabled
			R99 (CW = more DT, CCW = less DT)	**Sets dead time of gate outputs**
			R91	Fixed resistor for DT pin
F	HALL_PWR select	Use J6 to supply Hall power from 3.3 V or 5 V.	**J11 = AVDD**	**Supplies AVDD to Hall power**
			J11 = EXT	Supply external hall power from HALL_PWR_EXT
G	VDSLVL potentiometer, select and disable jumpers	Potentiometer to set VDSLVL between 0.1-2.5 V, VDSLVL_SEL to select voltage source, disable jumper to disable VDSLVL	**J15 = POT**	**VDSLVL set from potentiometer**
			J15 = EXT	VDSLVL set from VDS_EXT
			J13 = Populated	**VDSLVL is disabled (100 kΩ to GVDD)**
			J13 = DNP	**VDSLVL is enabled**
			R92	**Sets VDSLVL from 0.1 V-2.5 V**
H	DRV8328 A/B or C/D select	0-ohm resistors to populate depending of variant of DRV8328 used on the EVM.	**R1-R10 = DNP, R11 – R21 = 0-ohm**	**DRV8328A is populated**
				DRV8328B is populated
			R1-R10 = 0-ohm, R11 – R21 = DNP	DRV8328C is populated
				DRV8328D is populated

Table 3-2. Description of user selectable settings on DRV8328AEVM (continued)

Id.	Setting Name	Description	Position	Function
I	DRVOFF switch	Turns off the gate driver outputs.	**S2 = Down**	**Drivers are on**
			S2 = Up	Drivers are off (DRVOFF is enabled)
J	Phase voltage feedback	Resistor divider and filtering capacitor for phase voltage feedback to MCU ADCs.	R67, R70, C45	Phase A voltage feedback
			R68, R71, C46	Phase B voltage feedback
			R69, R72, C47	Phase C voltage feedback

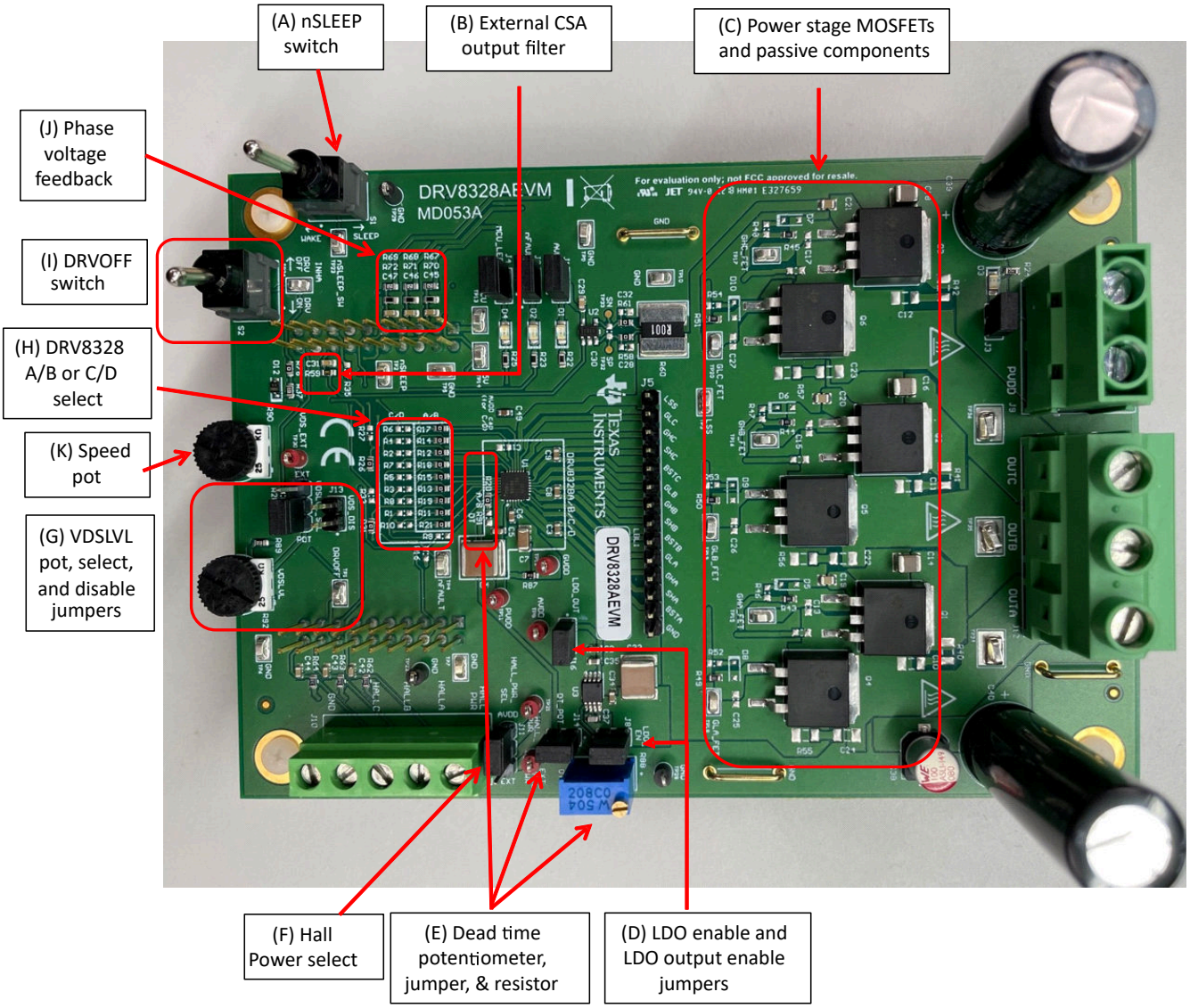

Figure 3-6. User-adjustable jumpers, resistors, and switches on DRV8328AEVM

3.4.1 DRV8328A/B Compatibility

The DRV8328AEVM default is the DRV8328A (Hardware variant), but can also be compatible with the DRV8328B. The main difference is that DRV8328A operates in 6x PWM mode and DRV8328B operates in 3x PWM mode. Figure 3-7 shows the default resistors to select the A/B variant when the DRV8328A or DRV8328B is used. Ensure resistors R1-R10 are removed, C1 is removed, and resistors R11-R21 are populated (except R16).

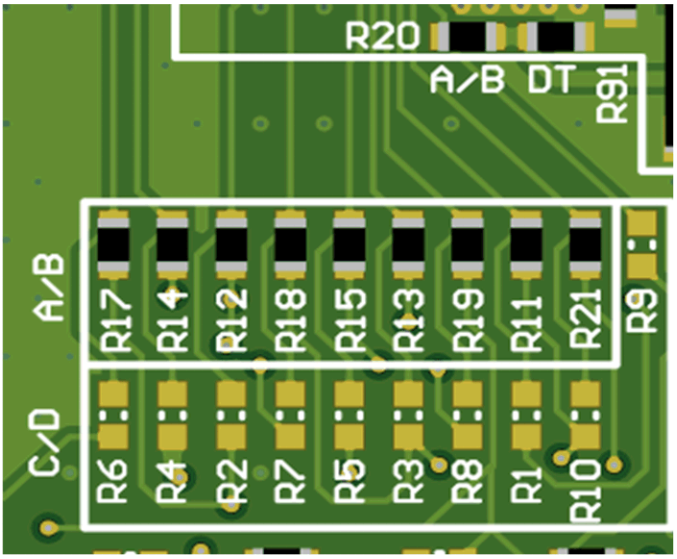

Figure 3-7. Resistors to populate for DRV8328A/B device

Table 3-3 shows the resistors to be only populated as well as their pin and functions.

Table 3-3. DRV8328A/B pinout, function, and populated resistors

DRV8328A/B Pin	Function	Populated Resistors
18	INHC	R11
19	INHB	R12
20	INHA	R13
21	INLC	R14
22	INLB	R15
23	INLA	R17
24	nFAULT	R18
25	nSLEEP	R19
26	VDSLVL	R20
27	DT	R21

3.4.2 DRV8328C/D Compatibility

The DRV8328AEVM is also compatible with the DRV8328C and DRV8328D variants to spin a 3-phase Brushless-DC motor but requires modifications to the EVM. The main modifications are removing and populating the correct 0-ohm resistors so pins of the DRV8328C/D variants are properly configured for their functions.

The DRV8328C and DRV8328D device remove the VDSLVL and dead time pins and are replaced with a DRVOFF shutdown pin and LDO (AVDD). The main difference between the two devices are that DRV8328C operates in 6x PWM mode and DRV8328D operates in 3x PWM mode.

Figure 3-8 shows the default components to select the C/D variant when the DRV8328C or DRV8328D is used. Ensure resistors R11-R21 are removed, resistors R1-R10 are populated, and C1 is populated. You can use the spare capacitor C45 to populate to C1.

It is also good to remove J8 and J16 to prevent AVDD from back-powering into the external LDO since AVDD comes from the DRV8328C/D.

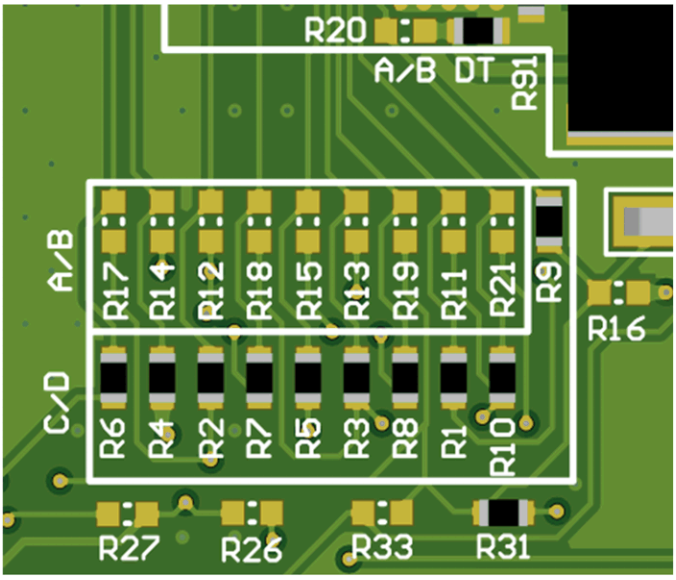

Figure 3-8. Resistors to populate for DRV8328C/D device

Table 3-4 shows the resistors to be only populated as well as their pin and functions.

Table 3-4. DRV8328C/D pinout, functions, and populated resistors

DRV8328C/D Pin	Function	Populated Components
18	DRVOFF	R6
19	AVDD	R4/C1
20	INHC	R2
21	INHB	R7
22	INHA	R5
23	INLC	R3
24	INLB	R8
25	INLA	R1
26	nSLEEP	R10
27	nFAULT	R9

3.5 Interfacing DRV8328AEVM and LAUNCHXL-F280049C LaunchPad

The DRV8328AEVM 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 DRV8328 device. These 40 pins are grouped into 4 ports in respect to the LAUNCHXL-F280049C (J1 to J4). Table 3-5 and Table 3-6 list the interfacing of these ports of the DRV8328AEVM headers J3 and J4.

Table 3-5. Connections for Header J3 on DRV8328AEVM (DNP in bold)

J3 Pin Number	DRV8328AEVM Function	LAUNCHXL-F280049C Function	Description
1	**AVDD (DNP)**	+3.3 V	3.3 V LaunchPad Supply
2	+5 V	+5 V	5 V LaunchPad Supply
3	POT_MCU/NC_49C	PGA1/3/5_GND	Not used
4	GND	GND	GND connection
5	Not used	GPIO13/SCIBRX	Not used
6	VSENA	ADCINA5	Phase A Voltage Sense

Table 3-5. Connections for Header J3 on DRV8328AEVM (DNP in bold) (continued)

J3 Pin Number	DRV8328AEVM Function	LAUNCHXL-F280049C Function	Description
7	Not used	GPIO40/SCIBTX	Not used
8	VSENB	ADCINB0	Phase B Voltage Sense
9	**nSLEEP_DFLT**	NC	nSLEEP for internal use only.
10	VSENC	ADCINC2	Phase C Voltage Sense
11	**CTAP**	ADCINB3/VDAC	Center tap voltage sense.
12	VSENPVDD	ADCINB1	PVDD Bus Voltage Sense
13	Not used	SPIACLK	Not used
14	NC_MCU/POT_49C	ADCINB2	General Purpose pot for MCU (R90)
15	**nFAULT_DFLT**	ADCINC4	nFAULT for internal use only.
16	ISENA	ADCINC0	LSS current sense
17	Not used	GPIO37	Not used
18	Not used	ADCINA9	Not used
19	Not used	GPIO35	Not used
20	**VDSLVL/C_TAP**	ADCINA1/DACB_OUT	VDSLVL from DAC. C_TAP for internal use only.

Table 3-6. Connections for Header J4 on DRV8328AEVM

J4 Pin Number	DRV8328AEVM Function	LAUNCHXL-F280049C Function	Description
1	INHA	GPIO10/PWM6A	PWM used to switch Phase A High-side FET
2	GND	GND	GND connection
3	INLA	GPIO11/PWM6B	PWM used to switch Phase A Low-side FET
4	MCU_LED	SPIASTE	Visual feedback for LaunchPad connection.
5	INHB	GPIO8/PWM5A	PWM used to switch Phase B High-side FET
6	**nFAULT_DFLT**	NC	nFAULT for internal use only.
7	INLB	GPIO9/PWM5B	PWM used to switch Phase B Low-side FET
8	Not used	NC	Not used
9	INHC	GPIO4/PWM3A	PWM used to switch Phase C High-side FET
10	Not used	XRSn	Not used
11	INLC	GPIO5/PWM3B	PWM used to switch Phase C Low-side FET
12	Not used	SPIASIMO	Not used
13	HALLA	GPIO58	Hall sensor A from motor
14	Not used	SPIASOMI	Not used
15	nSLEEP_49C	GPIO30	nSLEEP signal (active low)
16	DRVOFF	GPIO39	Active-high output to disable gate drivers

Table 3-6. Connections for Header J4 on DRV8328AEVM (continued)

J4 Pin Number	DRV8328AEVM Function	LAUNCHXL-F280049C Function	Description
17	Not used	GPIO18*/XCLKOUT	Not used
18	HALLB	GPIO23/LED4	Hall sensor B from motor
19	nFAULT_49C/CSAREF	GPIO25	nFAULT signal (active low)
20	HALLC	GPIO59	Hall sensor C from motor

Note

There are many resistors that are not populated for internal use only. Ensure the correct resistors are populated so every has signal has only signal path. If multiple signal paths are present, or no signal path is present, the device may not work as intended.

4 Hardware Setup

The hardware required to run the motor control is the LAUNCHXL-F280049C LaunchPad development kit, the DRV8328AEVM, a Micro-USB cable, and a power supply with a DC output from 4.5-V to 60-V. Follow these steps to set up the evaluation module:

1. Ensure all resistors, jumpers, and switches are set up accordingly according to the device variant used. The DRV8328AEVM by default is populated with and configured for the DRV8328A. If using the DRV8328C or DRV8328D, please follow Section 3.4.2 to configure the board for the DRV8328x device variant populated for U1.
2. Mate the DRV8328AEVM board to the top half of the LAUNCHXL-F280049C LaunchPad development kit (mates to J1/J3 and J2/J4 of LaunchPad, as in Figure 3-3). Observe the correct orientation when placing DRV8328AEVM 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 J12 on DRV8328AEVM. Phases OUTA, OUTB, and OUTC are labeled in white silkscreen on the PCB top layer. If using a sensored algorithm on the LaunchPad development kit, connect Hall sensors to the 5-pin connector J10.
4. Connect the DC power supply to header J9. Observe the correct polarity PVDD and GND connections on the DRV8328AEVM connector J9.
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 DRV8328AEVM 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.

5 Firmware and GUI Application

The DRV8328AEVM can implement sensored, sensorless, or Field-oriented control for commutating a 3-phase Brushless-DC motor. The GUI for the DRV8328AEVM supports sensored trapezoidal commutation using Hall sensor feedback and allows for basic trapezoidal motor control functions such as acceleration, duty cycle control, PWM switching frequency, MCU dead time insertion, braking, and direction changes. The bus and phase voltage feedback circuits as well as the external CSA provide voltage and current feedback from the motor for over-current and motor voltage protection.

There are two versions of the GUI. The DRV8328A_DRV8328C_EVM_GUI only supports the “A” and "C" versions of the DRV8328, and the DRV8328B_DRV8328D_EVM_GUI only supports the "B" and "D" versions of the DRV8328.

Variant	GUI
DRV8328A	DRV8328AEVM GUI
DRV8328B	DRV8328BEVM GUI
DRV8328C	DRV8328CEVM GUI
DRV8328D	DRV8328DEVM GUI

To access the GUIs, please visit https://dev.ti.com/gallery/search/drv8328 . You must register a TI account in order to access the Gallery.

5.1 Connecting to the DRV8328xEVM GUI

Follow the instructions in Section 5 and ensure the LAUNCHXL-F280049C is connected to the PC. Turned on the supply to power the DRV8328AEVM and LAUNCHXL-F280049C.

Access the GUI Composer Gallery and search for "DRV8328" as shown in Figure 5-1. Click on the version of the GUI depending of the DRV8328 variant configured on the EVM. If using the DRV8328AEVM out of the box, select the DRV8328A_DRV8328C_EVM_GUI tile on the left.

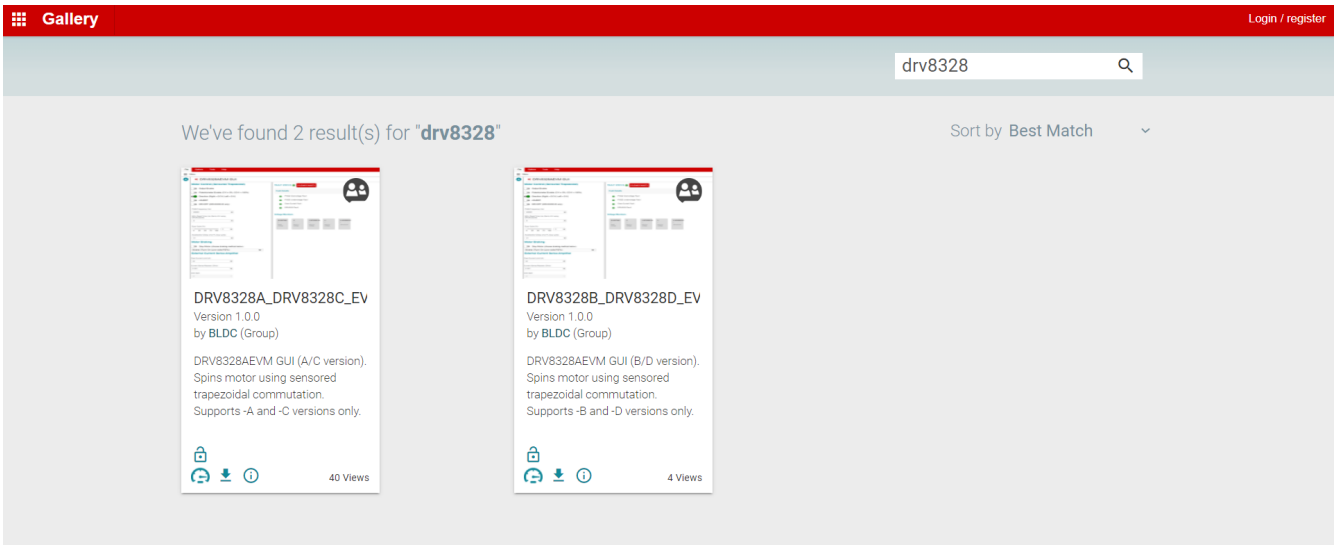

Figure 5-1. DRV8328AEVM GUI tiles in the Gallery for A, B, C, and D variants

Accept the readme that appears. The GUI will detect the LAUNCHXL-F280049C and automatically download the program into the MCU. Once complete, the “Hardware Connected” message appears at the bottom left hand corner as shown in Figure 5-2.

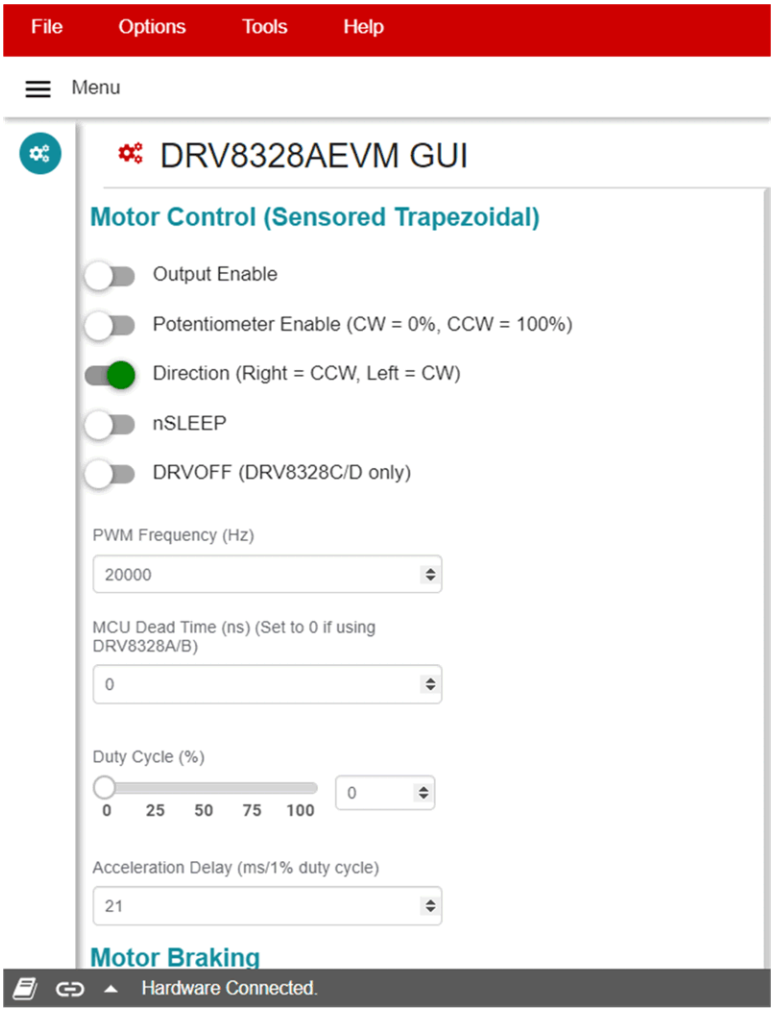

Figure 5-2. Hardware Connected message in the bottom-left hand corner

As shown in Figure 5-3, the following defaults should appear when the GUI is connected:

- **Direction** – Enabled
- **PWM Frequency (Hz)** – 20000
- **MCU Dead Time (ns)** – 0
- **Acceleration Delay (ms/1% duty cycle)** – 21

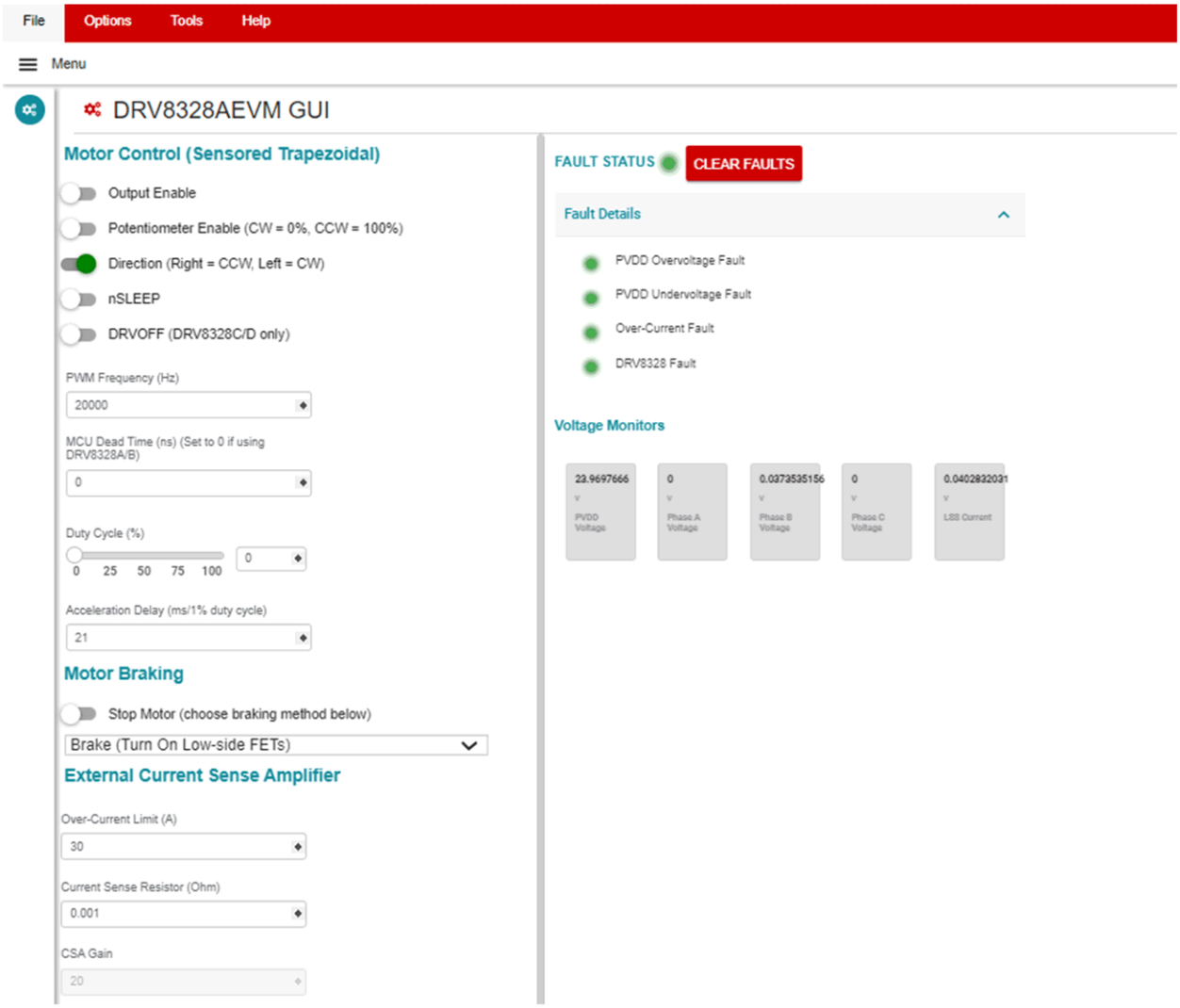

Figure 5-3. DRV8328A_DRV8328C_EVM GUI loaded with default settings

5.2 DRV8328AEVM GUI Quick Start Guide

1. Enter the PWM frequency in Hz using the “PWM Frequency (Hz)” text box. Press Enter.
2. Adjust the MCU dead time and Acceleration Delay values. For DRV8328A/B, it is recommended to use the DT potentiometer and set MCU dead time to 0 ns.
3. Click on the “Output Enable” switch.
4. To control the motor speed using the potentiometer R91, turn the potentiometer all the way counterclockwise to set to 0% speed. Click on the “Potentiometer Enable” switch to use the potentiometer to control the speed of the motor. If you do not wish to use the potentiometer, skip this step.
5. Turn the potentiometer clockwise or adjust the “Duty Cycle” slider to control the speed of the motor from 0% to 100%.
6. Use the “Direction” switch to switch the direction of the motor.
7. Use the drop-down menu in “Motor Braking” to determine the motor braking type. Click on “Stop Motor” to stop the method with the selected braking type.

5.3 Using the DRV8328AEVM-GUI

The GUI offers the following features:

MOTOR CONTROL SETTINGS

- **Output Enable** – Global enable flag to run the motor at the selected duty cycle.

- **Potentiometer Enable** – Enables potentiometer R90 to control the duty cycle of the motor. Duty cycle is updated in the Duty Cycle slider in real time. Turn all the way clockwise for 0% duty cycle, all the way counterclockwise for 100% duty cycle.
- **Direction** – Sets direction of the motor. When enabled, motor spins counterclockwise. When disabled, motor spins clockwise. When the direction is changed, the motor will coast to a stop, wait 1 second, then accelerate to the duty cycle in the opposite direction.
- **nSLEEP** – Places the DRV8328 in a low-power sleep mode. nSLEEP toggle switch only works when resistor R26 is populated and resistor R75 is DNP.
- **DRVOFF (DRV8328C/D only)** – Disables all gate drivers in Hi-Z state.
- **PWM Frequency –** Sets the PWM switching frequency of the motor in Hz.
- **MCU Dead Time** – Sets the MCU dead time to the PWM inputs in ns. Recommended to set DT to the minimum on the DRV8328A/B by setting placing 0-ohm resistor for R91.
- **Duty Cycle** – Sets the duty cycle of the motor when potentiometer is disabled.
- **Acceleration Delay –** Sets the acceleration and deceleration ramp rate in ms per 1% duty cycle.

MOTOR BRAKING SETTINGS

Stop Motor – Stops the motor when toggled according to the braking method in the drop-down menu. The two methods are brake (turn on all low-side MOSFETs) and coast (float all MOSFETs).

EXTERNAL CSA SETTINGS

- **Over-current Limit –** Sets the overcurrent limit in amps. If ISEN is measured to be over the overcurrent limit, Over-Current fault is triggered.
- **Current Sense Resistor** – Sets the resistor value in ohms for the shunt resistor onboard the EVM. Default resistor populated is 0.001 ohm.
- **CSA Gain** – Gain of the external CSA on the EVM. Fixed at 20 V/V.

FAULT STATUS BITS

- **Fault Status –** Logical “or” of all faults. When a fault occurs, output enable is set to 0 and duty cycle is set to 0 and Fault Status bit is set.
- **PVDD Overvoltage Fault –** PVDD is over 60 V.
- **PVDD Undervoltage Fault –** PVDD is under 4.5 V.
- **Over-Current –** Measured LSS current is over the Over-Current threshold.
- **DRV8328 Fault –** Fault indicated by the DRV8328. See DRV8328 datasheet.

6 Schematics

6.1 DRV8328A/B/C/D

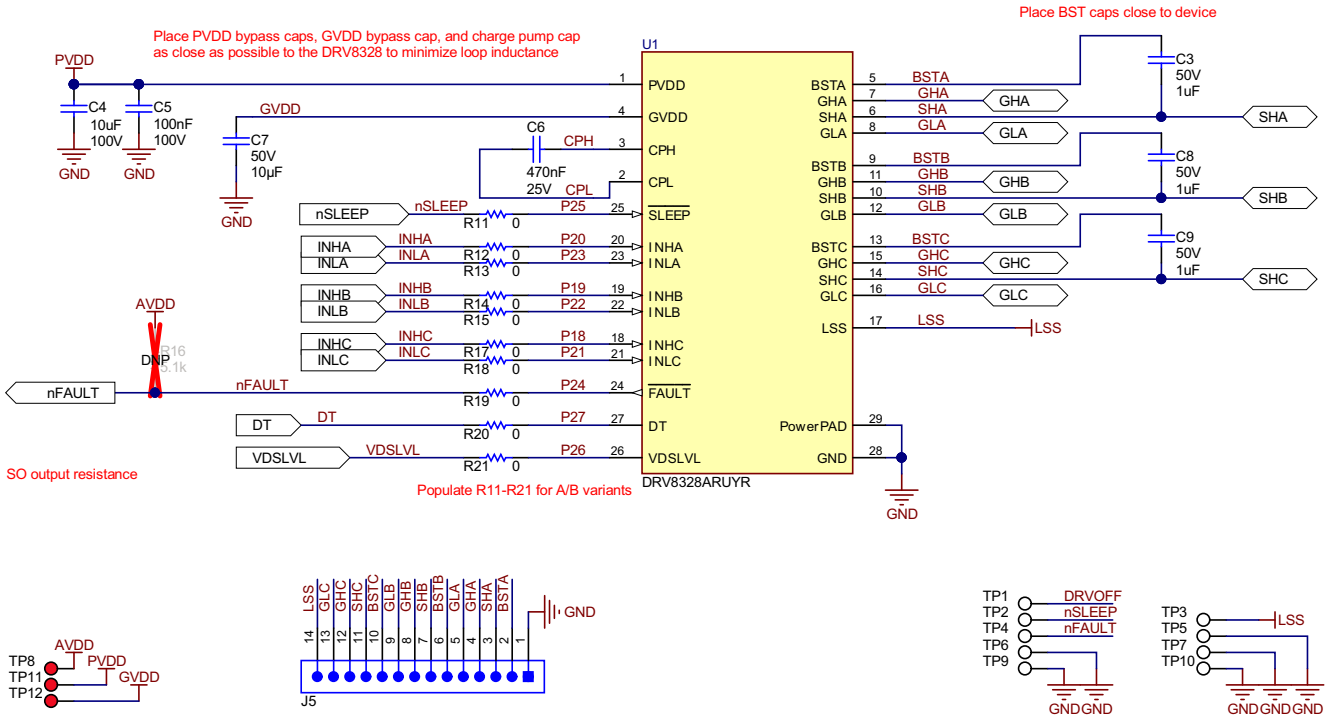

Figure 6-1. DRV8328A/B/C/D Schematic

6.2 DRV8328C/D variant select

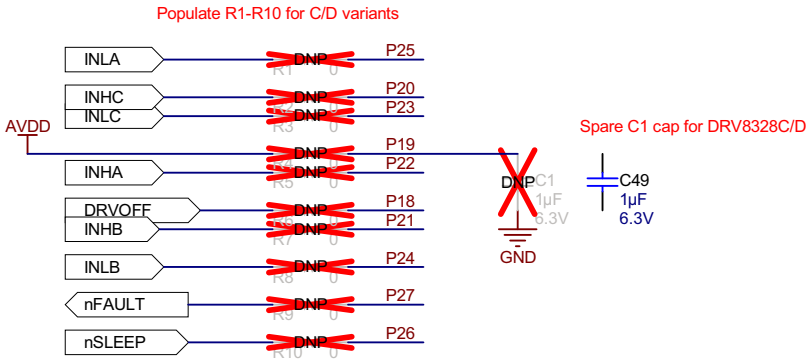

Figure 6-2. DRV8328C/D variant select schematic

6.3 Status LEDs

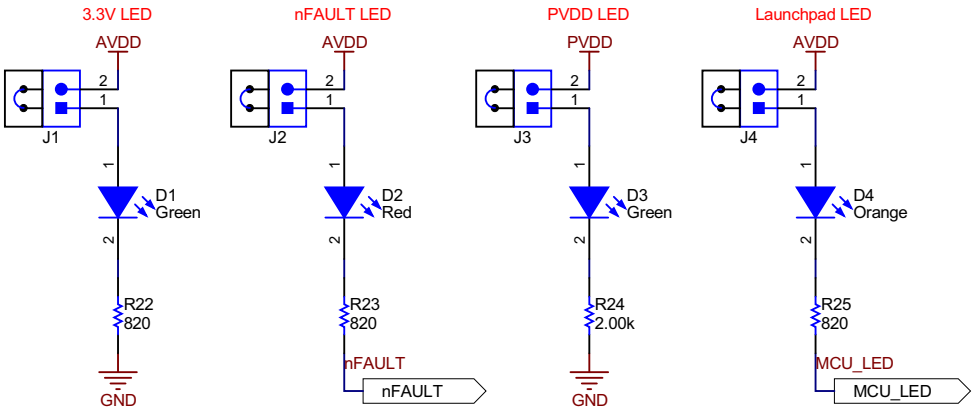

Figure 6-3. Status LEDs schematic

6.4 LaunchPad Connectors and Connections

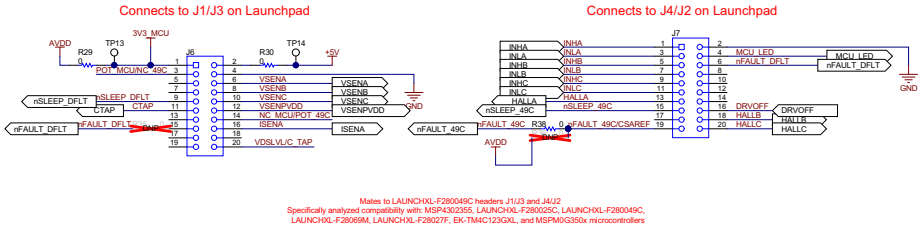

Figure 6-4. LaunchPad Connectors and Connections schematic

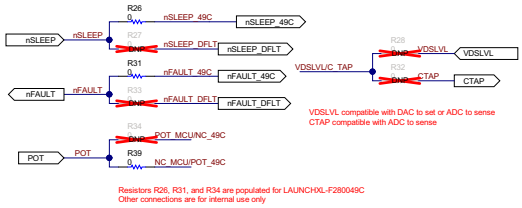

Figure 6-5. LaunchPad resistor selection for LAUNCHXL-F280049C compatibility schematic

6.5 External 3.3V LDO

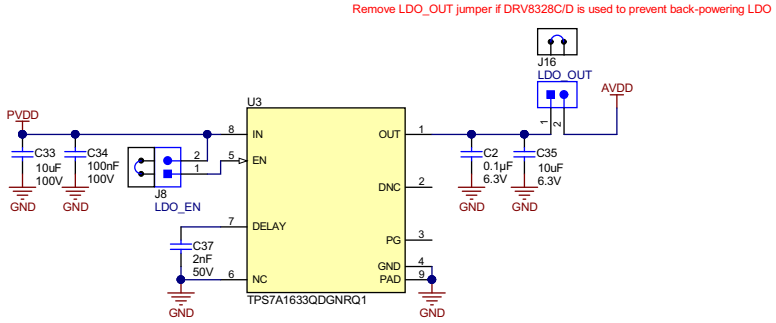

Figure 6-6. External 3.3V LDO schematic

6.6 Power Stage and MOSFETs

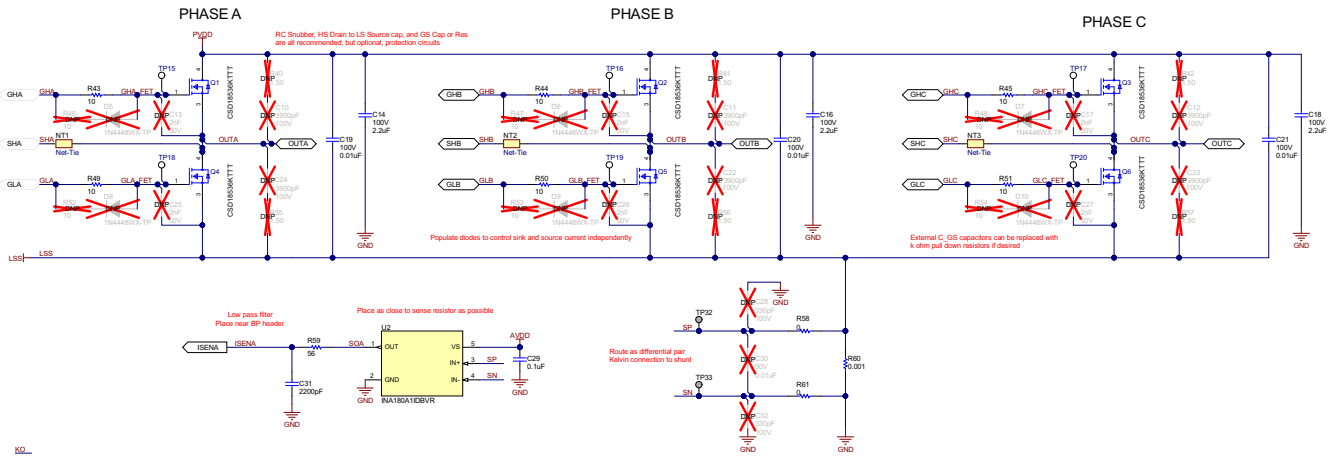

Figure 6-7. Power stage and MOSFETs schematic

6.7 Main Supply Input

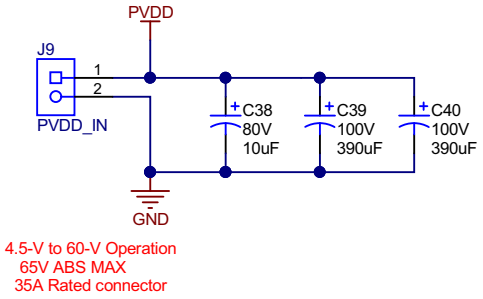

Figure 6-8. Main supply input schematic

6.8 Hall Sensor and Hall Power Selection

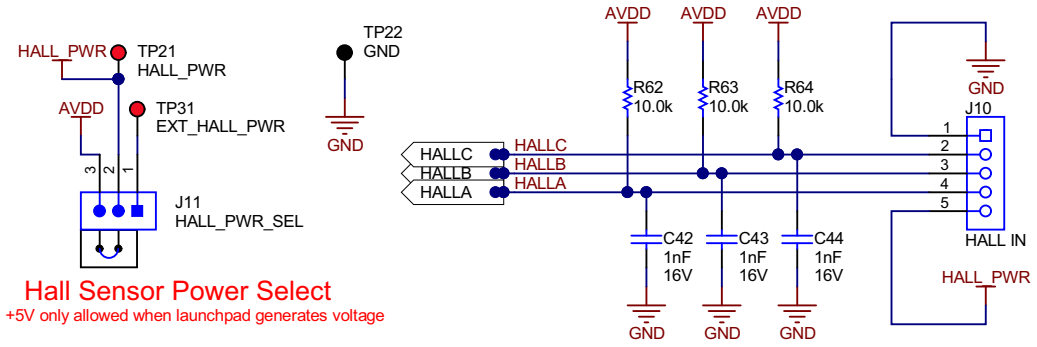

Figure 6-9. Hall Sensor and Hall Power Selection schematic

6.9 Connectors, Selectors, and Analog Control Interface

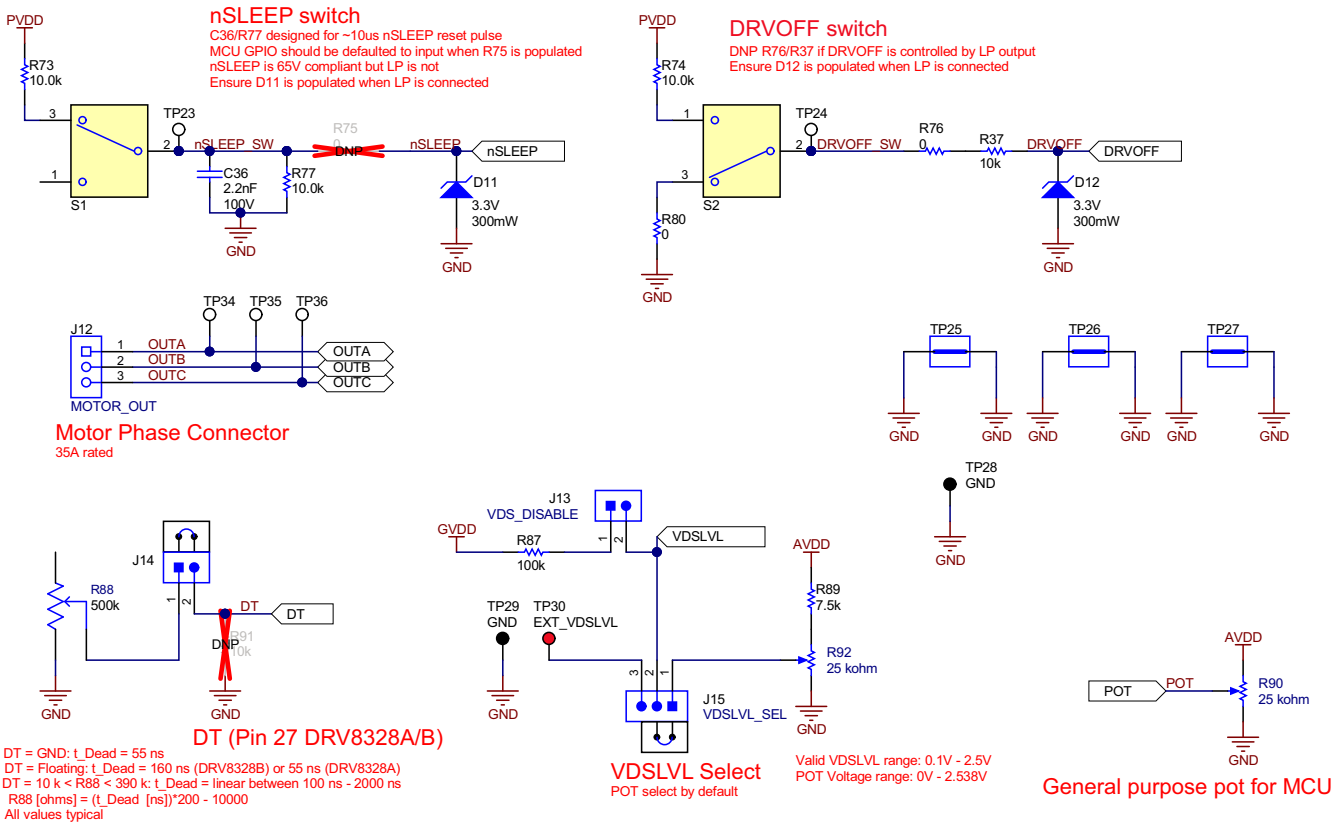

Figure 6-10. Connectors, Selectors, and Analog Control Interface schematic

6.10 Voltage Sense and Protection

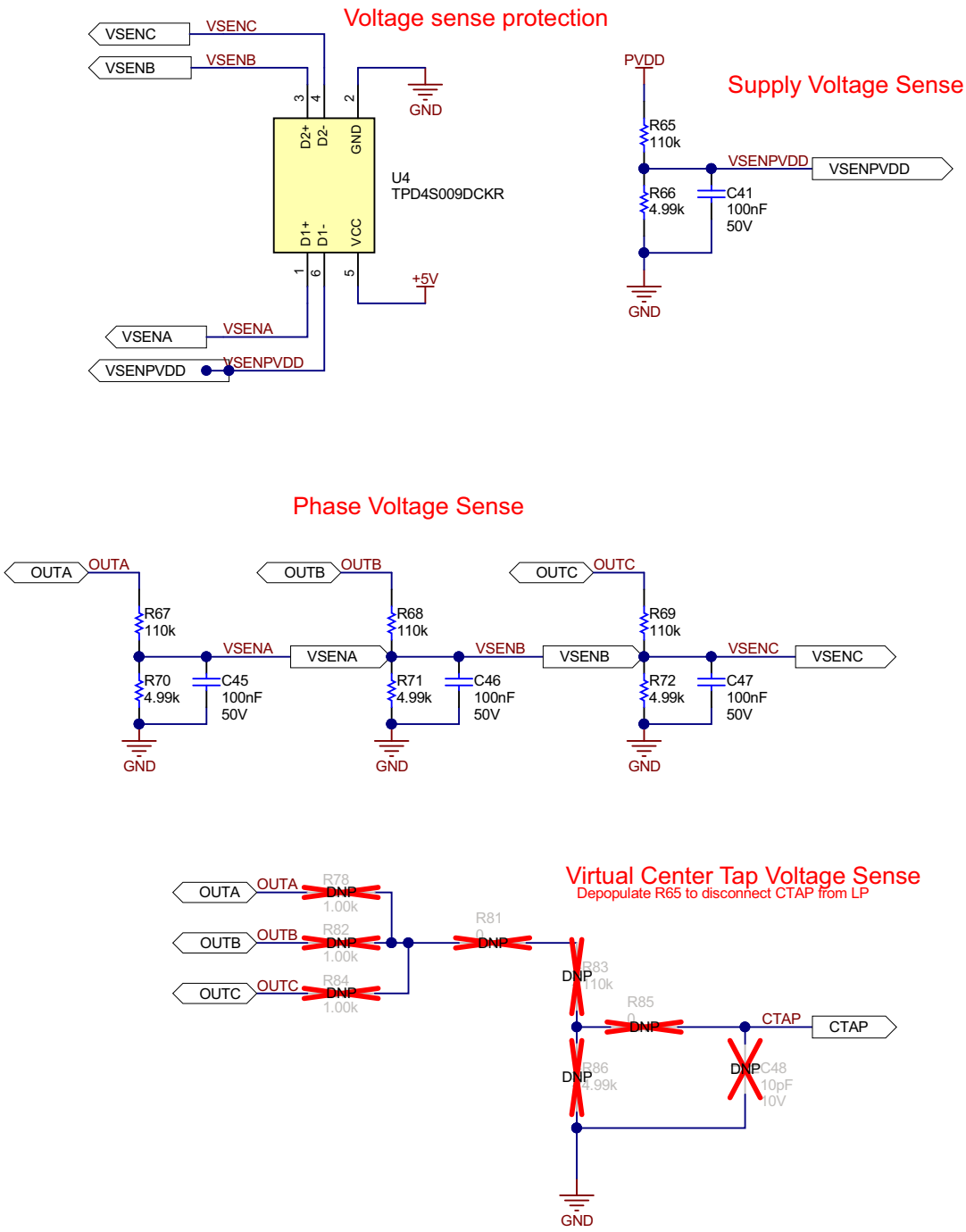

Figure 6-11. Voltage Sense and Protection schematic

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7 Revision History

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

Changes from Revision * (November 2021) to Revision A (August 2022)	Page
• Updated images to production version of DRV8328AEVM	2

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NOTE:

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

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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

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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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.

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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.

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