Stepper Motor Driver DRV8825

Power dissipation considerations

The DRV8825 Stepper Motor Driver driver IC has a maximum current rating of 2.5 A per coil, but the current sense resistors further limit the maximum current to 2.2 A, and the actual current you can deliver depends on how well you can keep the IC cool. The carrier's printed circuit board is design to draw heat out of the IC, but to supply more than approximately 1.5 A per coil, a heat sink or other cooling method is require.

This product can get **hot** enough to burn you long before the chip overheats. Take care when handling this product and other components connect to it.

Please note that measuring the current draw at the power supply will generally not provide an accurate measure of the coil current. Since the input voltage to the driver can be significantly higher than the coil voltage, the measured current on the power supply can be quite a bit lower than the coil current (the driver and coil basically act like a switching step-down power supply). Also, if the supply voltage is very high compare to what the motor needs to achieve the set current, the duty cycle will be very low, which also lead to significant differences between average and RMS currents. Additionally, please note that the coil current is a function of the set current limit, but it does not necessarily *equal* the current limit setting. The actual current through each coil changes with each microstep. See the DRV8825 Stepper Motor Driver datasheet for more information.

Key differences between the DRV8825 Stepper Motor Driver and A4988

The DRV8825 carrier was design to be as similar to our A4988 stepper motor driver carriers as possible, and it can be use as a drop in replacement for the A4988 carrier in many applications because it shares the same size, pinout, and general control interface. There are a few differences between the two modules that should be note , owever:

- The pin use to supply logic voltage to the A4988 is use as the DRV8825 Stepper Motor Driver FAULT output, since the DRV8825 Stepper Motor Driver does not require a logic supply (and the A4988 does not have a fault output). Note that it is safe to connect the FAULT pin directly to a logic supply (there is a 1.5k resistor between the IC output and the pin to protect it), so the DRV8825 Stepper Motor Driver module can be use in systems design for the A4988 that route logic power to this pin.
- The SLEEP pin on the DRV8825 is not pull up by default like it is on the A4988, but the carrier board does connect it to the FAULT pin through a 10k resistor. Therefore, systems intended for the A4988 that route logic power to the FAULT pin will effectively have a 10k pull-up on the SLEEP pin. (This 10k resistor is not present on the initial (md20a) version of the DRV8825 carrier.)
- The current limit potentiometer is in a different location.
- The relationship between the current limit setting and the reference pin voltage is different.
- The DRV8825 offers 1/32-step microstepping; the A4988 only goes down to 1/16-step.
- The mode selection pin inputs corresponding to 1/16-step on the A4988 result in 1/32-step microstepping on the DRV8825 Stepper Motor Driver. For all other microstepping resolutions, the step selection table is the same for both the DRV8825 and the A4988.
- The timing requirements for minimum pulse durations on the STEP pin are different for the two drivers. With the DRV8825, the high and low STEP pulses must each be at least 1.9 us; they can be as short as 1 us when using the A4988.
- The DRV8825 has a higher maximum supply voltage than the A4988 (45 V vs 35 V), which means the DRV8825 can be use more safely at higher voltages and is less susceptible to damage from LC voltage spikes.
- The DRV8825 Stepper Motor Driver can deliver more current than the A4988 without any additional cooling (based on our full-step tests: 1.5 A per coil for the DRV8825 vs 1.2 A per coil for the A4988 Black Edition and 1 A per coil for the original A4988 carrier).
- The Stepper Motor Driver uses a different naming convention for the stepper motor outputs, but they are functionally the same as the corresponding pins on the A4988 carrier, so the same connections to both drivers result in the same stepper motor behavior. On both boards, the first part of the label identifies the coil (so you have coils "A" and "B" on the DRV8825 Stepper Motor Driver and coils "1" and "2" on the A4988).
- For those with color-sensitive applications, note that the DRV8825 carrier is purple.

In summary, the DRV8825 carrier is similar enough to our A4988 carriers that the minimum connection diagram for the A4988 is a valid alternate way to connect the DRV8825 Stepper Motor Driver to a microcontroller as well:
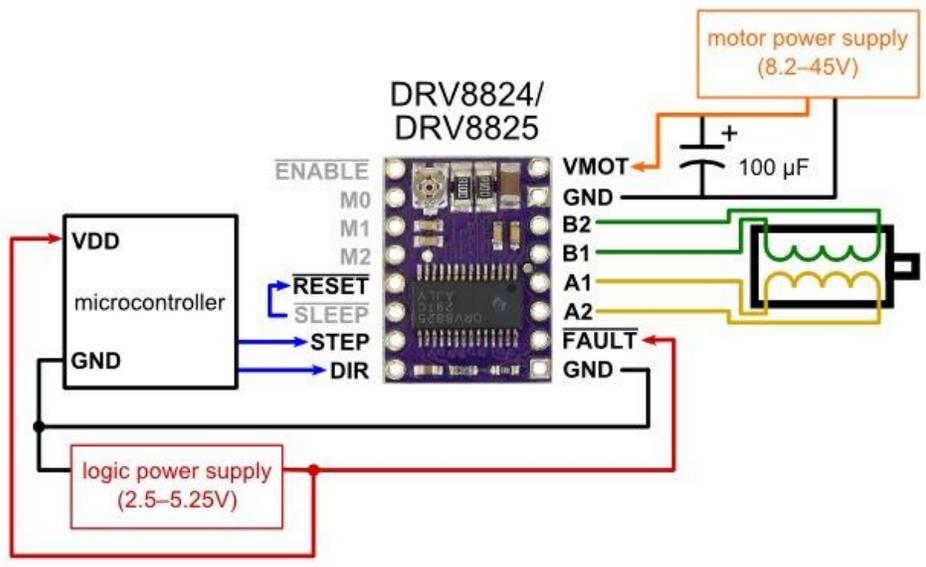
Alternative minimal wiring diagram for connecting a microcontroller to a DRV8824/DRV8825 stepper motor driver carrier (full-step mode).