

# The ECE 118 DRV8811 2.0A Stepper Motor Module

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## Background:

Texas Instruments' DRV8814 is a complete microstepping motor driver with built-in translator for easy operation. It is designed to operate bipolar stepper motors in full-, half-, quarter-, and eighth-step modes, with an output drive capacity of up to 35 V and  $\pm 2$  A. The DRV8811 includes a current mirror off-time current regulator which has the ability to operate in Slow or Mixed decay modes. It comes in 24-pin HTSSOP packages with a ground pad heatsink. Internal circuit protection includes thermal shutdown with hysteresis, undervoltage monitoring, and crossover current protection.

The ECE118 DRV8811 Stepper Motor Module provides a convenient and robust interface for the DRV8811. Separate connectors provide access to the logic-level inputs, Stepper motor coil output connections, and the IC's power supply. This module makes use of a 2950 regulator for pull-ups and a TL7726QP clamp for protecting the digital inputs.

The data sheet for the DRV8811 translator and driver chip can be found on the TI.com website at: <http://www.ti.com/product/drv8811>

## Using the ECE118 DRV8811 2.0A Stepper Motor Module:

In order to make use of the ECE118 DRV8811 Stepper Motor Module, you will need to be familiar with the various connectors and their purposes. Since each connector has a single logical function (inputs, outputs, power supply, etc.) this is straightforward.

### Logic-Level Inputs (J1):

Access to the logic-level inputs of the DRV8811 is provided through J1. Enable, Direction, and STEP control for the stepper driver is specified through these connections.

There is no logic ground on this board to reduce noise. As such, care must be taken to provide a common ground back at the power supply or battery.

The pinout of J1 is as follows (all other pins are NO CONNECT):

J5	Connection
Pin 3	Step
Pin 4	Direction
Pin 5	Enable

### Full/Half-Step Connections (J3 and J4):

The DRV8811 is capable of both full step (2 coils energized), half-step (1-2 coils energized), quarter-step and eighth-step; this is set with the jumpers J4 and J3. If both jumpers are OPEN, then the chip is set to FULL STEP mode. The truth table for micro stepping is:

J4 J3	Step Mode
0-0	FULL STEP
1-0	HALF-STEP
0-1	QUARTER-STEP
1-1	EIGHTH-STEP

**Current Limiting (JP1):**

The DRV8811 is capable of sensing and limiting the current in the coils, and actively or passively allowing the field to collapse once that is reached. This is implemented on the jumper stack JP1:

JP1	Coil Current
000	0.5 Amp
001	1.0 Amp
011	1.5 Amp
111	2.0 Amp

**Motor/Load Connections (J2):**

Connections to the coils of the stepper motor should be made through the screw-terminal connector located at J2. The pinout of J2 is as follows:

J2	Connection
pin 1 & pin 2	Phase A
pin 3 & pin 4	Phase B

**Power Supply and High-Current Ground Connector (J5):**

**J5, pin 1:** The DRV8811 requires a power supply for both the motors as well as its logic circuitry. Provisions for this are made through J1, pin 1, which includes a Schottky diode to provide reverse bias protection. A 2950 low drop-out, 100mA voltage regulator is provided on the Module PCB to clamp the digital inputs between -0.2V and 5.2V. The chip will operate between 8V (minimum) and 30V (maximum). This makes the DRV8811 Module much easier to use, since it includes its own voltage regulation and does not require an externally regulated +5V supply. Note that there is no ground connection between the input port (J1) and the power input (J5), for noise reasons. The source of the input signal should be connected back to ground at the power supply or batteries.

***DRV8811 Power Supply Requirements:***     $+8V < V_{in} (J1, \text{pin } 1) < +30V$

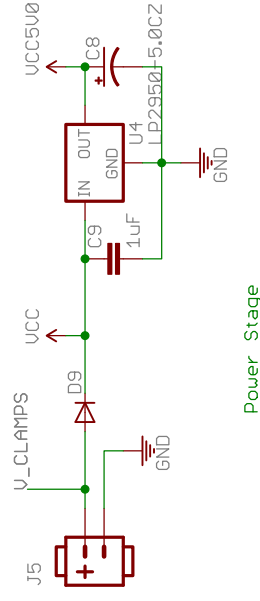
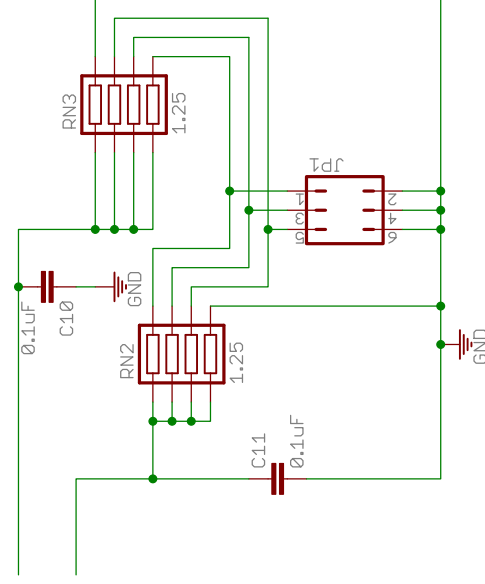
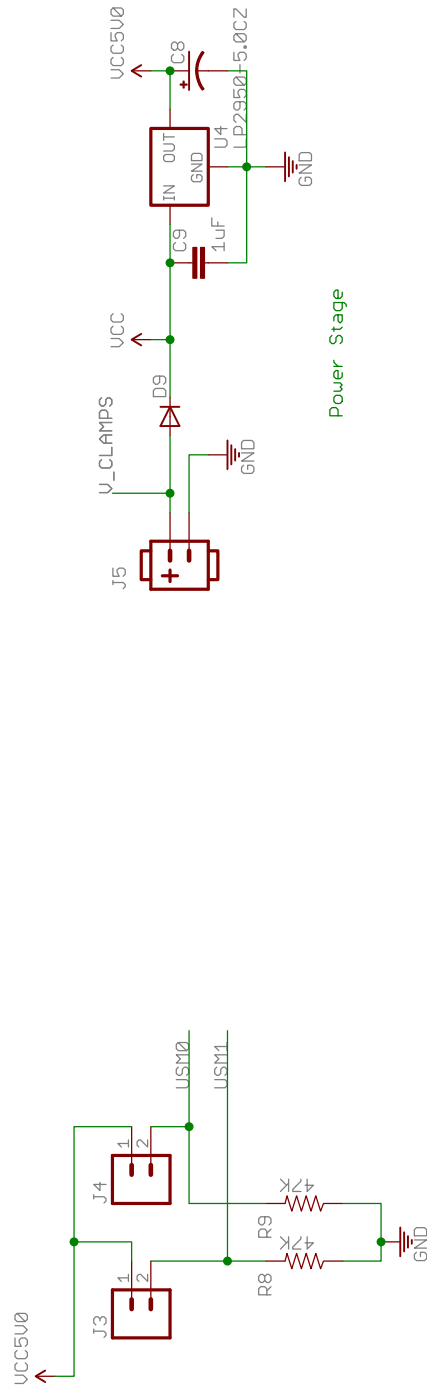
**J5, pin 2:** Since the module is capable of switching both coils on the stepper motor to 2.0A, care must be taken in the methods employed returning this substantial current to ground. For this reason, a separate high-current ground connection is available at J5, pin 2. A separate connection should be made between J5, pin 2 and the power supply or batteries. This will ensure that the logic power supply maintains a clean ground (the microcontroller must have a common ground to the power supply as well).

J1	Connection
Pin 1	Power (8V to 38V)
Pin 2	High Current Ground

**ECE118 DRV8811 2.0A Stepper Motor Module Schematic:**

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