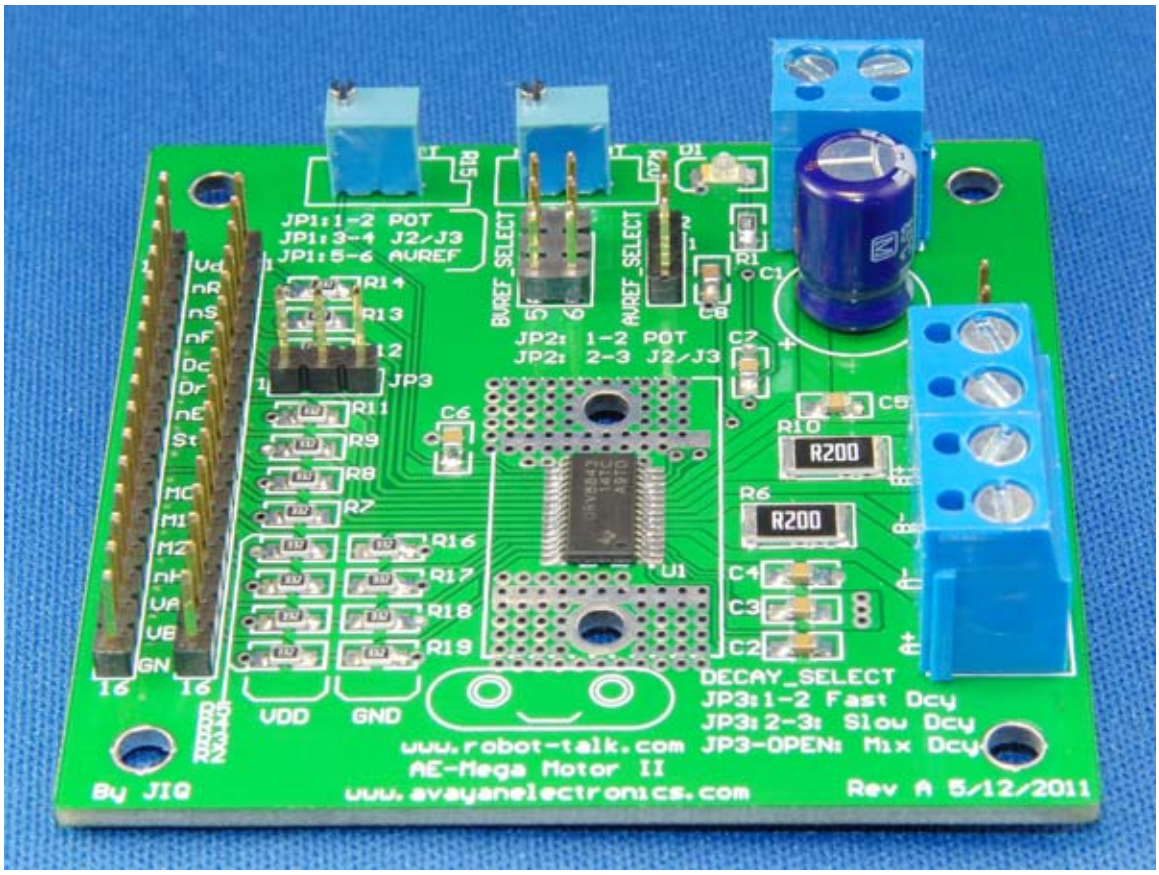
# AE MegaMotor II Manual

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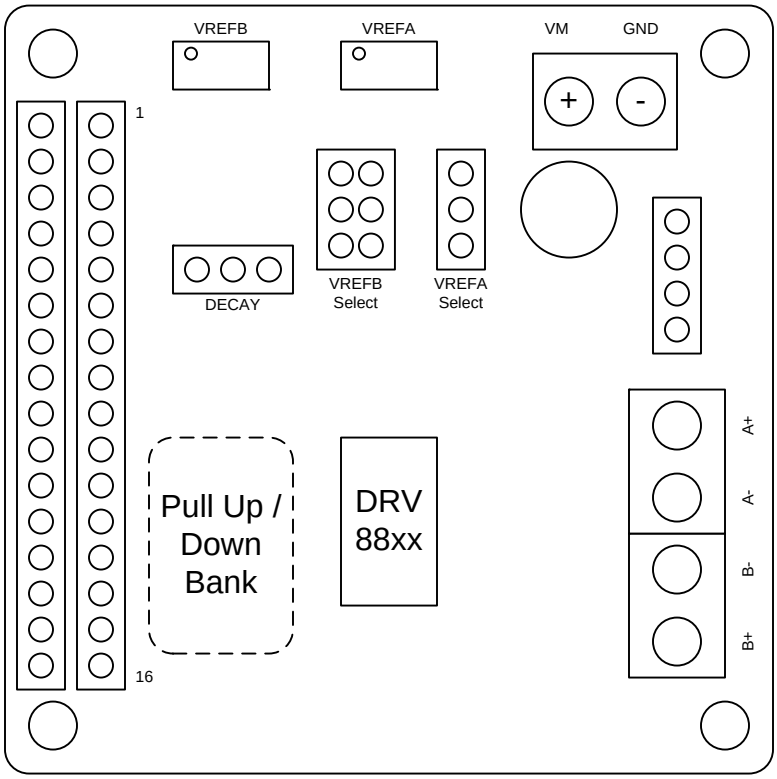
**1.6/2.5A Dual DC Motor, 1.6A/2.5A Microstepper Motor Controller**




**AE-MegaMotor II:**

- Controls either two DC motors (up to 2.5A per channel) or 1 bipolar stepper motor (Up to 2.5A per phase). For single DC motor, refer to the AE-MDL-MegaBridgeDesign.
- Easy access to all signals. Two different implementations (DC or Stepper) documented on the back side.
- Selectable reference voltage to either external access, or internally derivable through a potentiometer.

**Ease of Use Features:**

- Input power wires and power outputs screwed into terminal block.
- Measures 2.5” by 2.5”
- Dual 16 pin header connector offers easy access to signals. Second header can work of as an access point to a second board or test stakes for in application monitoring.
- All possible combinations tackled by the use of potentiometers and jumpers.

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## Description:

The AE-MegaMotor II is the most flexible motor control module you will ever find. Measuring only 2.5” by 2.5” this module can either drive two DC motors or one bipolar steppers with or without internal microstepping.

The “secret” is a new family of drivers with different functionality but identical pinout, from Texas Instruments, which consists on drivers such as the DRV8802/12/13/14/24/25/41/43. The different flavors are:

**DRV8812/13 Flavor**: Dual H Bridge to control a bipolar stepper with external microstepping generation.

**DRV8802/14 Flavor**: Dual H Bridge to control two DC motors with PHASE/ENABLE interface.

**DRV8824/25 Flavor**: Dual H Bridge with internal indexer to microstep a bipolar stepper motor.

**DRV8841/43 Flavor**: Dual H Bridge to control two DC motors with IN1/IN2.

Other than the differences mentioned above, all of these devices offer the exact same features:

1. Current control engine to regulate current. Vital for stepper driving and torque control on DC motors.
2. Selectable slow, fast or mixed current decay modes.
3. Over Current Protection and fault signaling.
4. Identical pinout, allowing for completely different devices to be soldered into the very same board!

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## Control Signals and AE-MegaMotor II Header pinout:

| J2 and J3 pins | Dual H Bridge Flavors | Internal Indexer Flavors |
|---|---|---|
| | DRV8802/12/13/14/41/43 | DRV8824/25 |
| 1 | VDD (3.3V) | |
| 2 | nRESET (input) | |
| 3 | nSLEEP (input) | |
| 4 | nFAULT (output) | |
| 5 | DECAY | |
| 6 | PHASE A (AIN2) | DIRECTION |
| 7 | ENABLE A (AIN1) | nENABLE |
| 8 | ENABLE B (BIN1 | STEP |
| 9 | PHASE B (BIN2) | NC |
| 10 | AI 0 | MODE0 |
| 11 | AI 1 | MODE1 |
| 12 | BI 0 | MODE2 |
| 13 | BI 1 | nHOME (output) |
| 14 | A_VREF | |
| 15 | B_VREF | |
| 16 | GROUND | |

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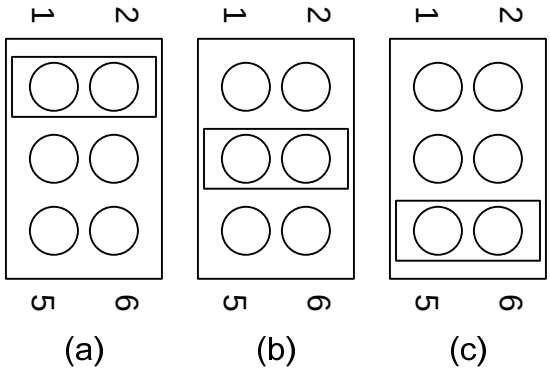
## Jumper Configurations:

Jumpers will allow the configuration of the reference voltage selection. Depending on the device soldered into the AE-MegaMotor II module, jumpers must be configured accordingly. Per example, Dual DC variants will most likely require dual VREF analog inputs, while the microstepper will require a single VREF analog input.

Jumper settings will also control whether the VREF analog input is derived from the provided potentiometer or through the header connections.

**Jumper JP1 (B_VREF Select):**




| JP1 Position | Diagram | VREF B Source | Suggested Usage |
|---|---|---|---|
| JP1:1-2 | (a) | Potentiometer R15 | Pre configure VREF B and allowed stalling current on Dual DC Mode. |
| JP1:3-4 | (b) | Headers J2 or J3 | Drive VREF B through microcontroller DAC as with an external High Resolution Microstepping Engine. |
| JP1:5-6 | (c) | VREFA | Tie to VREFA as when using a DRV8824/25. |

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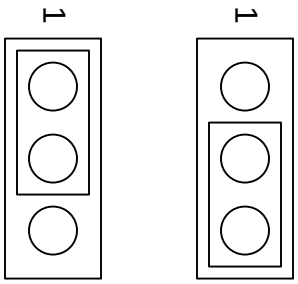
**Jumper JP2 (A_VREF Select):**




(a) (b)

| JP2 Position | Diagram | VREF A Source | Suggested Usage |
|---|---|---|---|
| JP2:1-2 | (a) | Potentiometer R20 | Pre configure VREF A and allowed stalling current on Dual DC Mode or Sine Wave Peak on Bipolar Stepper Driving. |
| JP2:2-3 | (b) | Headers J2 or J3 | Drive VREF A through microcontroller DAC as with an external High Resolution Microstepping Engine. |

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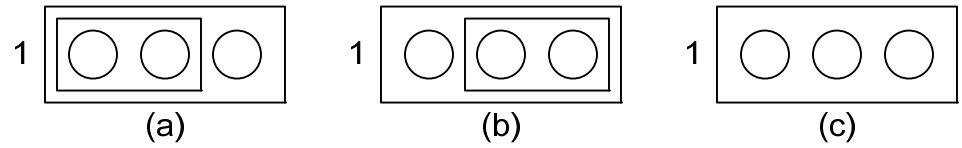
**Jumper JP3 (DECAY Select):**




| JP3 Position | Diagram | DECAY State | Suggested Usage |
|---|---|---|---|
| JP3:1-2 | (a) | Fast Decay | On DC motor, issues coasting while stopping. Not best for PWM as average current is less than on slow decay.<br><br>On Stepper motor, it causes highest current ripple. Only useful during sine wave quadrants 2 and 4. |
| JP3:2-3 | (b) | Slow Decay | Issues braking while stopping. Optimal for PWM as average current is higher than on fast decay.<br><br>On Stepper motor, it causes highest current ripple. Only useful during sine wave quadrants 2 and 4. |
| JP3:NONE | (c) | Mixed Decay or Headers J2 or J3 | When the DECAY pin is left open, the Mixed Decay mode is induced.<br><br>Mixed Decay is only meaningful on stepper driving.<br><br>Also, use this jumper setting when wanting to control DECAY externally with a microcontroller. |

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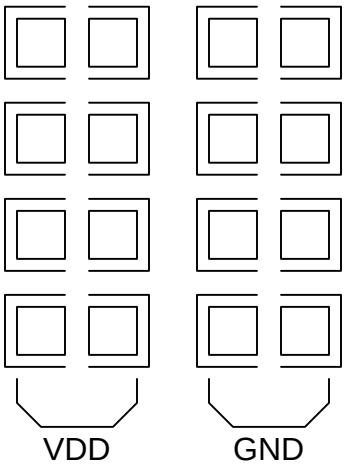
## Pull Up / Pull Down Resistors




The signals AIx and BIx can be modulated to induce up to 8 degrees of microstepping without the use of an analog output. However, when driving DC motors, or when using High Resolution Microstepping, it is best to fix these signals one way or the other. A series of resistor places have been allocated for these signals to be hardwired either HI or LO, in which case no further control is required.

Note that these signals are also the MODEx bits on the internal indexer version. In some cases, it also makes sense to preselect their state.

Soldering a resistor on the VDD side, pre configures the signal to a HI state. Soldering a resistor on the GND side, pre configures the signal to a LO state. Any resistor value larger than 3.3K can be used. 4.7K and 10K are typical values which will offer equally good results. Smaller than 3.3K resistors will result in currents larger than 1 mA. Although this current is not too large, it is completely unnecessary.

IMPORTANT: Do note solder a resistor on both the VDD and GND side or the signal will be configured to an unknown state.

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## Control Signals Description:

| Control Signal | Direction | Description |
|---|---|---|
| **All Devices** | | |
| VDD | Power | 3.3V power supply must be provided on this power rail |
| nRESET | Input | Clears the internal logic on the device. If an over current protection has shut down the driver, a low on this pin clears the fault and resumes operation. |
| nSLEEP | Input | A LO level on this pin places the device on low power mode. |
| nFAULT | Output | Open Collector output which signals if a fault has occurred (Thermal Shutdown, Over Current, etc.) |
| VREF | Analog Input | Configures ITrip Max Current according to the equation ITrip = VREF / (5 * RSENSE) |
| DECAY | Input | Specifies Current Recirculation Scheme. A LO configures for Slow Decay mode. An OPEN (or NC) configures for Mixed Decay mode. A HI configures for a Fast Decay mode |
| **H Bridge Control (DC motor or Stepper motor winding)** | | |
| PHASEx | Input | Selects direction of current flow on the H Bridge driving an inductive load. |
| ENABLEx | Input | A LO on this pin disables the H Bridge. A HI on this pin enabled the H Bridge. |
| Aix / Bix | Input | Current Select Bits. An internal 2 bit DAC used to scale down the maximum current that will be allowed through the H Bridge |

| Bipolar Microstepper | | |
|---|---|---|
| MODEx | Input | Selects the degrees of microstepping from full step to 32 degrees of microstepping. |
| DIRECTION | Input | Selects the direction of rotation (CW or CCW depending on how the motor is wired) |
| STEP | Input | A transition from LO to HI tells the device to increment one step or microstep as depending on DIRECTION and MODEx. |
| nENABLE | Input | A LO on this pin enables the device. A HI on this pin disables the device. |
| nHOME | Output | An output which goes asserted (LO) when the step being produced is the first on the internal lookup table. |

**For More Information:**

www.avayanelectronics.com contains all the files pertinent to assembling this board, such as schematic and Bill Of Materials. As of August 2011, Gerbers are no longer provided.

www.eBLDC.com continuously offers treatises on the usage of all Avayan Electronics modules.

www.robot-talk.com is a public forum where users can post their questions.

www.DriverDudes.com carries an assortment of modules in a variety of forms ranging from bare boards to fully assembled modules.

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