DC Motor Driver 6-24V 6A

Small and powerful PWM driver board for DC motors, LED lamps, resistive heating elements or other DC loads.

The board comes with all SMD parts assembled. A potentiometer, 3-pin header, jumper and screw terminals are included, but not mounted. The connectors and potentiometer are optional and it's up to the user to assemble the board using the included parts or solder wires directly to the board.

The driver consists of several different sections. First the input voltage is regulated to a stable 5V to power the other circuits. Two OP-amps are wired as a triangle wave oscillator with a fixed frequency. The resulting waveform is compared with a variable voltage from either the onboard potentiometer or an external control voltage using one OP-amp. The output from the comparator is a square wave with variable duty cycle which is used to switch an N-channel MOSFET.

Please note that this module is using an N-channel FET to switch the negative terminal of the connected load, or a low-side switch as it's commonly called. Make sure the connected load is NOT grounded by other means. If it's a motor that's grounded through the chassis of a car for instance, the speed will always be 100%.

The PWM frequency is set to around 12kHz for a balance between efficiency and switching noise. The frequency can be shifted down by adding a small capacitor to the two holes marked "TCap". The frequency can only be lowered by adding an extra capacitor. To make the frequency higher, the onboard capacitor must be removed.

As mentioned above, the duty cycle (which translates to motor speed or LED brightness) can be adjusted using either a potentiometer or an external control voltage. Because of the simple nature of the circuit, only one input can be active at one time. The header marked "POT CV GND" is used to select the input. See detailed wiring examples below.

Included parts:

- 1x PCB mounted potentiometer 6mm knurled shaft
- 1x 3-pin header
- 1x 2-pin jumper
- 2x 2-pin 3.5mm pitch screw terminals

Functions

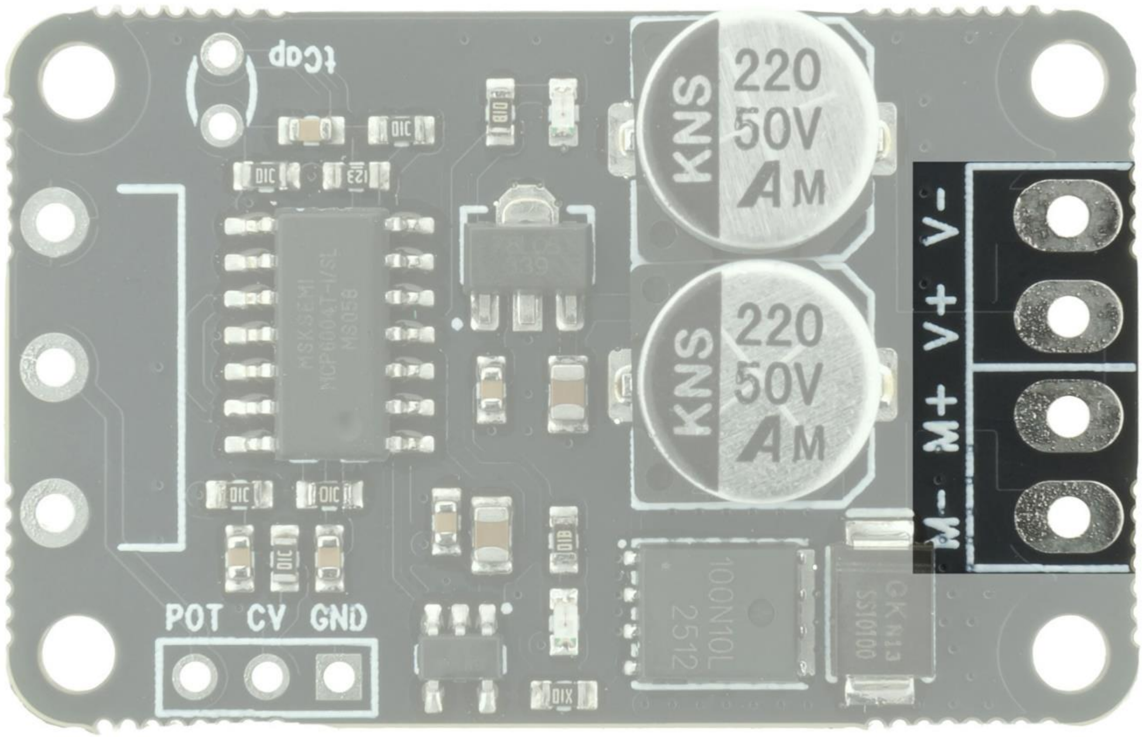
- Speed control for DC motors
- Brightness control for LED lamps
- Adjustable from 0% to 100%
- Highly efficient design, no heatsink required
- External CV or manual control

Specifications

- Supply voltage: 6 - 24 VDC
- Output current: 6 A (momentarily higher)
- Duty cycle: 0 ... 100 %
- Control voltage: 0 ... 5 V
- Dimensions: 40 x 25 mm
- Mounting holes: ø2.5 mm / 35 x 20 mm

Connections

Power in/out:



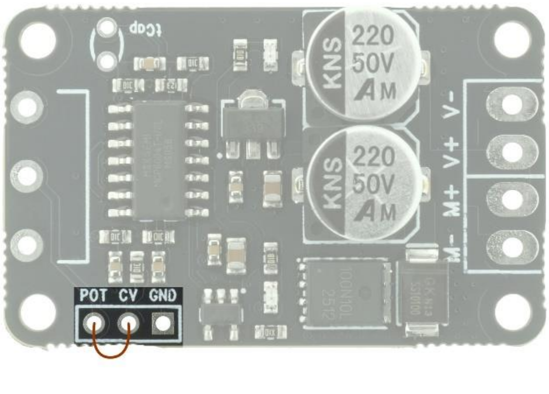
The pads have a spacing of 3.5mm and will fit the included screw terminals. The holes are 1.27mm in diameter and will fit wires up to 0.5mm² (AWG20).

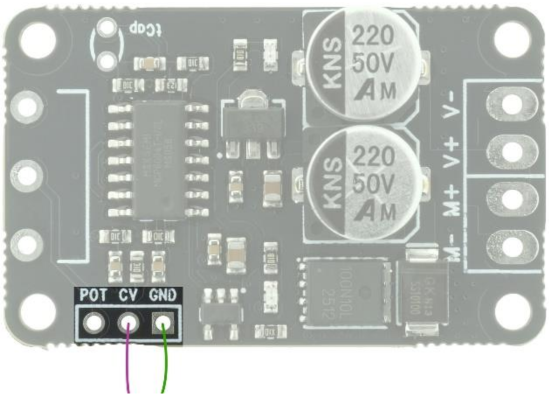
V+ and V- are connections for the supply voltage. The supply voltage should be in the range of 6V to 24V. The circuit will operate down to around 4.5V, but not guaranteed.

Make sure the connected power supply is able to supply enough current to drive the connected load!

M+ and M- are connections for the PWM output. M+ is directly connected to V+, while M- is connected to V- through the transistor.

CV source:



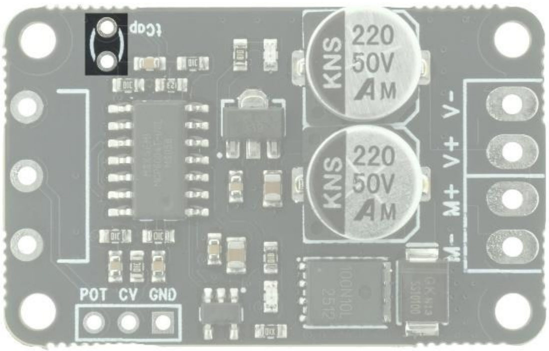


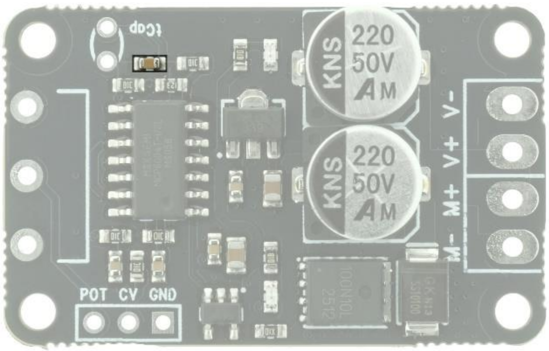
The duty cycle can be adjusted using either the onboard potentiometer or using an external control voltage. The 3-pin header selects which source to use.

The included pin header and jumper can be soldered to the board for changing source quickly. The jumper must be installed in the left-most position (bridging "POT" and "CV") to use the potentiometer.

When using an external control voltage, remove the jumper and connect wires from an external voltage source to "CV" and "GND". The control voltage connects to "CV", while the GND pin is the 0V reference. Acceptable CV range is 0V (0%) to 5V (100%).

Changing PWM frequency:





The module is pre-configured to run at a fixed frequency of around 12 kHz. This frequency is a good balance between efficiency and switching noise. Larger motors will often have more torque at a lower PWM frequency. To lower the PWM frequency, an extra capacitor can be soldered to the two holes marked "TCap".

The frequency can only be lowered by adding an external capacitor. To make the frequency higher, the onboard capacitor needs to be desoldered and replaced with a lower value. The right-hand image shows the internal 1.8 nF capacitor.

The optimal frequency for a specific motor can be difficult to calculate. An easier method is to simply try different values. Some example values to get started:

Tcap	Frequency
Internal only	12 kHz
1 nF	8.6 kHz
10 nF	2.2 kHz
100 nF	300 Hz
1 uF	27 Hz

Mechanical dimensions