

KT-5195 Hi Current DC Motor Speed Controller



This is a DC motor speed controller for motors up to 20A. It features:

- Potentiometer or 0-5V Control
- Open Loop PWM Speed Control
- Dual IRFZ44 MOSFET Output

Connections:

V+ - Motor Positive input Voltage
 M+ - Motor Positive
 M- - Motor Negative
 V- - Motor Negative input Voltage
 Vs - 12V Controller Power Supply Input
 COM - Common Power Supply Connection
 AIN - 0-5V Analog input
 COM - Common (Ground)



Note: Motor Power Supply must be connected to the V- and V+ terminals. If you are using separate power supplies then their negative terminals must be connected to a common ground for the motor controller to work properly.

Notes:

The IRFZ44 Mosfet has a maximum current of 49A, voltage of 55V and an on resistance of 17.5m Ω . In reality the Mosfets will overheat and the PCB tracks will not handle this much current. As two are used it can be assumed that for a motor current of 20A, each Mosfet will be conducting approximately 10A. This means that each Mosfet will dissipate approximately 1.75W into the heatsink. The provided heatsink is rated at 5 $^{\circ}$ C/W which will mean a temperature increase of approximately 17.5 $^{\circ}$ C above ambient. A fan will help with the heat dissipation if the motor is going to draw this much current continuously.

The PWM signal controlling the Mosfets is available at a PCB pad labeled PWM to the right of the Mosfet labeled Q2. If you wish this PWM output can be used to drive a solid state relay or other higher current capable FET.

If you wish to just monitor the PWM output of the controller a 50% duty signal is available on an unlabeled PCB pad next to pin 15 of the ATmega168 IC. This can be used as a sync input for your oscilloscope and the PWM output can be monitored from the PWM pad.

Assembly:

Assembly of the DC Motor PID Speed Controller is relatively simple, however there are a few things to note.

Start with the lowest components first, the resistors and diodes and then work your way up to the taller components.

Leave the Potentiometer, Mosfets and large heatsink until last.

The small heatsink goes between the voltage regulator VR1 and the PCB, on the exposed metal area. You may wish to use some heat transfer compound between the heatsink and the PCB as well as between the heatsink and VR1. Pre-bend the regulators legs so that it will lie flat against the heatsink. Insert the screw from underneath the board, through the board, heatsink and voltage regulator. Tighten the nut and then solder the legs of the regulator.

For the Mosfets and large heatsink, loosely attach the two Mosfets to the heatsink using the screws and nuts and heat transfer compound then insert the Mosfets into the PCB. You will notice that the heatsink will not sit flush with the board but a few millimeters above, with its legs through the holes, approximately level with the underside of the board. Tighten the nuts holding the Mosfets to the heatsink and then solder the Mosfets and the heatsink to the PCB.

If you wish to control the speed with a 0 to 5V signal do not solder in the potentiometer. Solder in the 3 terminal block

The Potentiometer can be mounted directly on the PCB in place of the 3-way terminal block, or the terminal block can be inserted to the PCB and the potentiometer can be mounted externally and wired to the terminals.

Controlling with 0-5V Signal

If you wish to control the speed with a 0 to 5V signal then connect the signal to the AIN and COM terminals

Parts List:

Part	Designator	Quantity
10R Resistor	R1,R2	2
1N4004 Diode	D3	1
10K Resistor	R4	1
22pF Cap Ceramic	C1,C2	2
0.1uF Cap 50V Monobloc	C3-C4 C6-C8	5
470uF Cap 50V Low ESR	C13	1
7805 Regulator	VR1	1
8MHz Crystal	X1	1
Large Heatsink		1
Small Heatsink		1
10K 16mm Potentiometer		1
2way Terminal	T2-T5	4
3way Terminal	T1	1
IRFZ44 MOSFET	Q1,Q2	2
FR302 Fast Recovery Diode	D2	1
ATMega168 Programmed	U1A,U1B	1
PCB		1