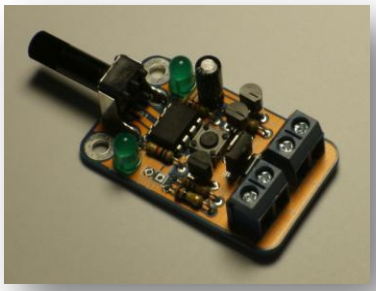
12V Dimmer Kit, version 2

User Manual



Description

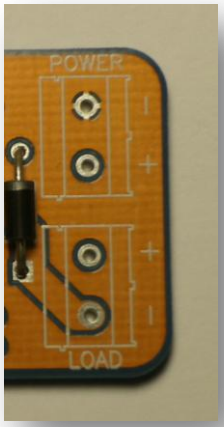
The 12V Dimmer Kit V2 is an especially efficient PWM (pulse-width modulation) controller for 12V loads up to 60 watts. It features a single dial control for 0-100% output as well as a pushbutton input that steps through five preset power levels.

Specifications

	Minimum	Typical	Maximum	units
Input voltage	3	12	16	volts
Output load	0		60	watts
PWM frequency		150		Hz

Limitations

1. Do not exceed the maximum power level of 60W.
2. Do not connect the power supply backwards.



Connections

Note: You may omit the terminal blocks and solder directly to the PCB for permanent installations.

Connect your power supply to the "POWER" terminal block. Make sure to observe the correct polarity (+ and -). Connect your load to the "LOAD" terminal block. The correct polarity is indicated on the PCB.

User Controls

Dial adjustment: Rotate the dial from far left (0% output) to far right (100% output).

Pushbutton: Push the button to advance from 0% (fully off), 1%, 10%, 25%, 50% and 100% power levels. Push the button again to repeat the sequence. The 12V Dimmer Kit V2 remembers the last setting even if power is interrupted.

One or more external pushbuttons can be connected to the 12V Dimmer Kit V2 via the "STEP" connector on the PCB. Use normally-open (NO), single-pole single-throw (SPST) momentary action switches.

Assembly Instructions

Assembly of the 12V Dimmer Kit should take between 10 and 30 minutes to complete, depending upon experience level. Please review all assembly instructions completely before beginning.

These instructions recommend installing the shortest parts first, then proceeding to the taller parts.

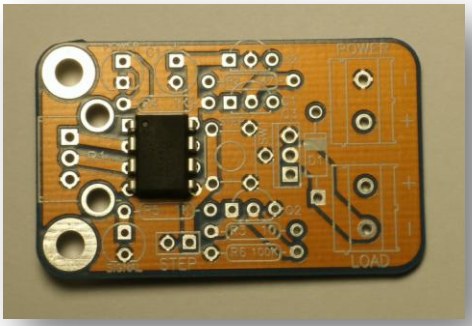
Required Tools

1. Soldering iron, solder
2. Side cutters, also known as diagonal cutters or flush cutters
3. Small screwdriver for tightening connections to terminal blocks

Component Inventory

Make sure you have all the required components. Some components are optional.

Qty	Description	Reference designator	Value
1	Printed circuit board		
1	Microcontroller	U1	ATtiny13A
1	Voltage regulator	U2	KA76L05
1	Dial potentiometer	R1	10K, linear taper
1	Resistor	R2	47Ω, 1/4W
1	Resistor	R3	10Ω, 1/4W
2	Resistors	R4, R5	1KΩ, 1/4W
1	Resistor	R6	100KΩ, 1/4W
1	Pushbutton	SW1	momentary contact, SPST, 4 or 5 pin
1	Flyback diode	D1	
2	LEDs	D2, D3	5mm, green diffused
1	Capacitor	C1	10µF electrolytic
1	NPN Transistor	Q1	PN2222A
1	PNP Transistor	Q2	PN2907A
1	MOSFET transistor	Q3	NTD4856N
2	Terminal block	J1, J2	2 position



Step 1: Install the Microcontroller IC

The microcontroller IC (U1) should be pre-installed in the PCB in the correct orientation. Solder all eight pins and then trim the excess leads on the bottom.

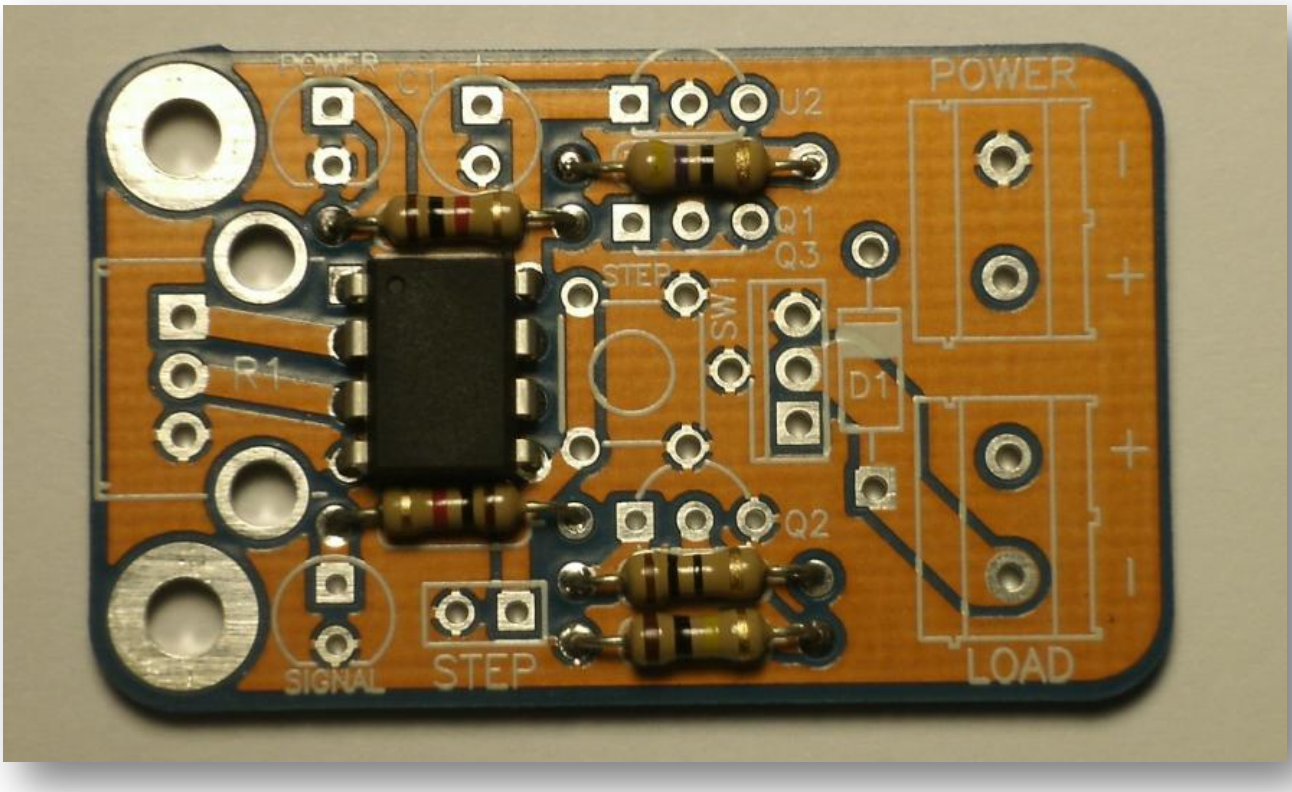
Step 2: Install the Resistors

Step 2.1: Identify resistors by color bands.

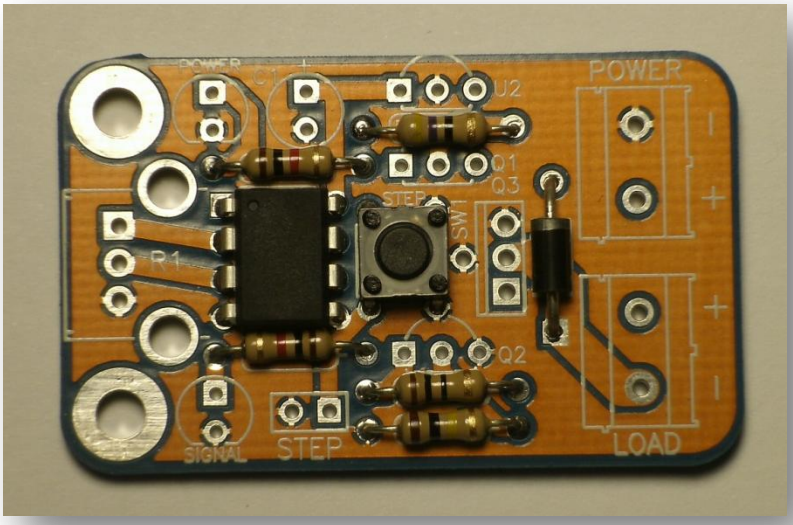
Note: R4 and R5 are the same value (1K).

Reference designator	Value (ohms)	Colors
R2	47Ω	Yellow, violet, black, gold
R3	10Ω	Brown, black, black, gold
R4*, R5*	1KΩ	Brown, black, red, gold
R6	100KΩ	Brown, black, yellow, gold

*Optional. If LEDs D1 and D2 are not installed, R4 and R5 are not needed.



Step 2.2: Install the resistors into the properly labeled locations on the PCB.



Step 3: Install the Push Button and Diode

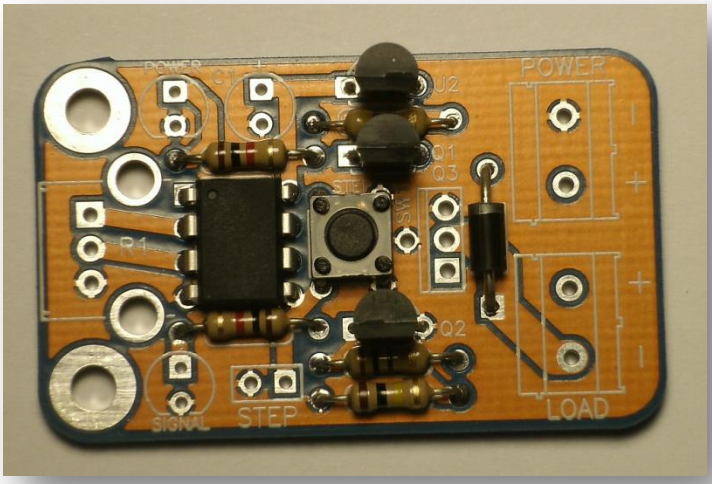
Notes:

1) The diode is polarized. The band marked on the diode must correspond with the band illustrated in the part outline on the PCB.

2) The pushbutton can have either four (4) or five (5) leads. Either one will work.

3) The pushbutton is optional. The 12V Dimmer Kit V2 can be operated entirely by the dial adjustment.

Step 4: Install the Small Transistors



Step 4.1: Identify the smaller transistors (and other transistor-shaped components).

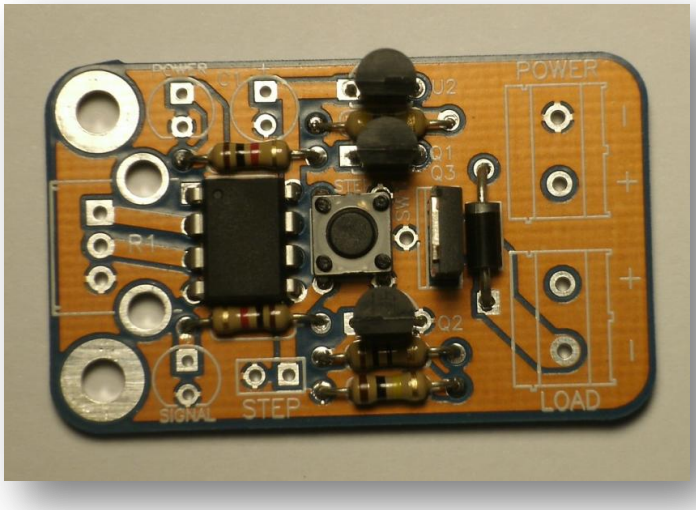
Reference designator	Part number	Position
U2	KA76L05	Top
Q1	PN2222A	Above pushbutton
Q2	PN2907A	Below pushbutton

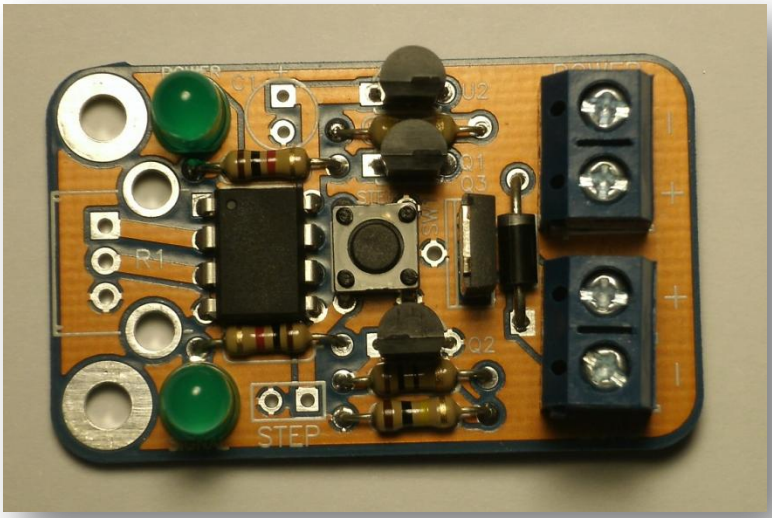
Step 4.2: Install the transistors and voltage regulator, using the part outline printed on the PCB as a guide. Solder the pins and trim the excess pins from the bottom of the PCB.

Step 5: Install the MOSFET transistor

Install the MOSFET transistor.

Note: The MOSFET transistor is polarized. Use the part outline on the PCB as a guide.





Step 6: Install the LEDs and Terminal Blocks

Notes:

1) The LEDs are optional. They give instant indications of both power and signal level at the expense of more power usage. For extremely low-power applications, they can be omitted. Also omit R4 and R5 when omitting the LEDs.

2) The LEDs are polarized. Each LED has a long lead and a shorter lead. Insert the long lead into the hole with a square pad.

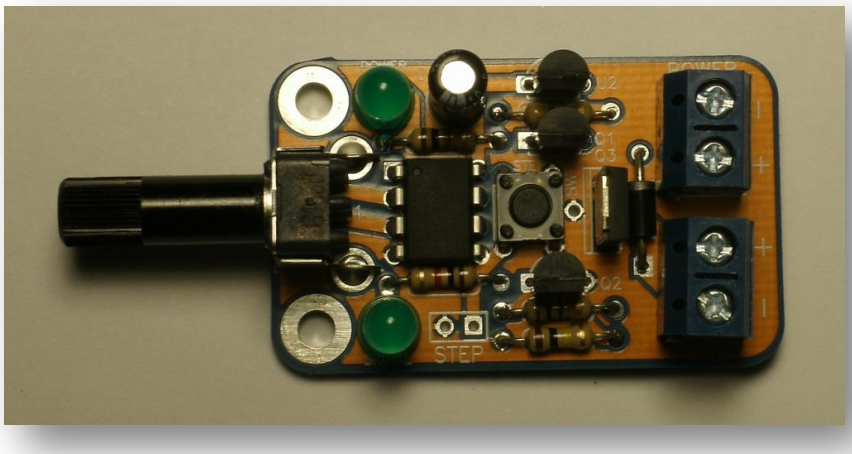
Step 7: Install the Capacitor and Potentiometer

Notes:

1) The capacitor is polarized. The capacitor has a large stripe that indicates its negative lead. Insert the negative lead into the hole that has the round pad.

2) The potentiometer is optional. The 12V Dimmer Kit V2 can be operated using only the pushbutton, but only at the preset power levels.

3) The potentiometer has two wide flanges that are inserted into the large holes on the PCB. These flanges should be soldered to the PCB for additional mechanical strength. You do not need to completely fill the holes with solder - just enough to make a good mechanical connection to the PCB.



You're done!