

Multimeter

Kit Information & Instructions



One of the most useful tools in the electronics enthusiast's arsenal is the multimeter. With the SparkFun Multimeter Kit, you can build your very own. This kit includes all the parts you'll need to build a device to test DC voltage, DC current, and resistance.

Kit includes:

- 4-digit 7-segment display
- 1 Ohm Resistor
- 1.2K Ohm Resistor
- 5.6K Ohm Resistor
- 10K Ohm Resistor (qty: 2)
- 1K Ohm Resistor (qty: 2)
- Multimeter PCB
- LM358 Op-Amp
- AtMega328
- LM317 3.3v Regulator
- Push-button
- 10uF Capacitor
- 100uF Capacitor
- Mini Power Switch
- Buzzer

STEP BY STEP INSTRUCTIONS

These steps are meant to be done in numerical order. Insert all parts on the top side of the board, and solder them on the

INSERT ALL PARTS ON THE TOP SIDE OF THE BOARD, AND SOLDER THEM ON THE BOTTOM SIDE.

1

ATmega328 (microcontroller): This part is polarized – make sure the notch on the chip coincides with the notch on the silkscreen of the PCB. You will need to gently bend the legs inward for the part to fit into the holes. Once the part has been placed, flip the PCB over and solder the legs in through the front of the board.

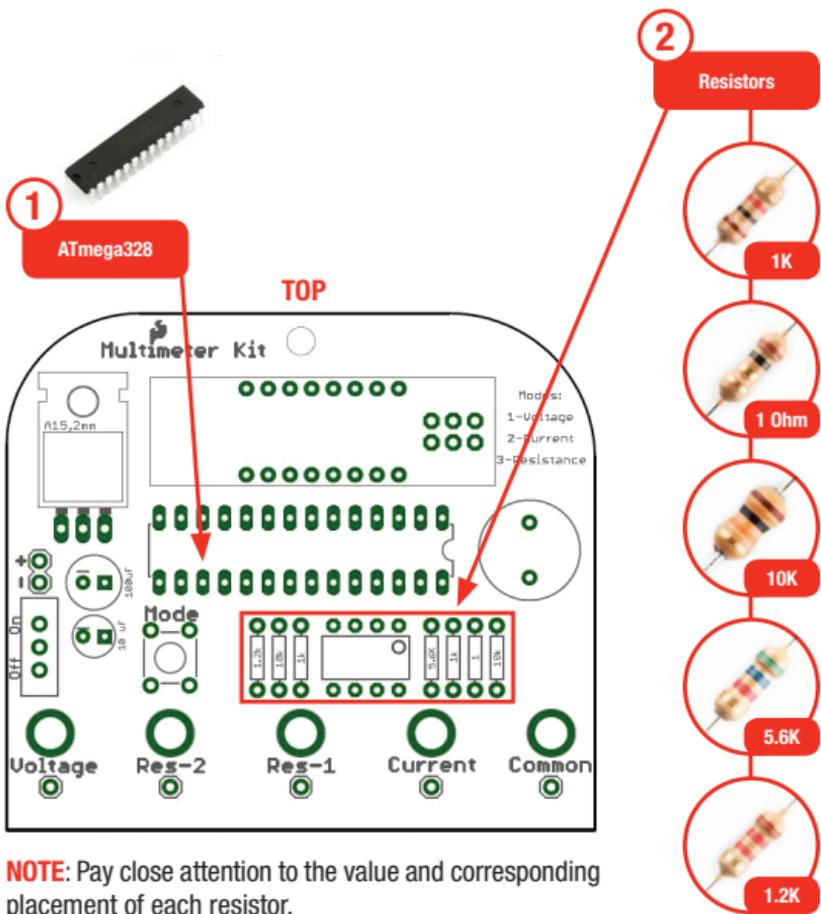
2

Resistors (reset pull-up): There are various values of resistors in this kit, make sure the right resistor goes in the right spot. The color band codes are as follows:

- 10k – Brown, Black, Orange, Gold
- 1 Ohm – Brown, Black, Gold, Gold
- 1k – Brown, Black, Red, Gold
- 5.6k – Green, Blue, Red, Gold
- 1.2k – Brown, Red, Red, Gold

Insert the resistor into the front of the PCB so that the body of the resistor fits inside the rectangular outline. Flip the board over, bend the legs outwards to secure that part, and then solder into place from the back of the board.

bottom side. After soldering each part, clip off each remaining leg; make sure to hold the leg while clipping it off. Also remember steps highlighted in yellow feature polarized components.



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3

LM358 OpAmp (voltage amplifier): This part is polarized – make sure the notch on the chip coincides with the white circle on the silkscreen of the PCB. Like the ATmega, you'll need to bend the legs in slightly.

4

Momentary Push Button (mode button): Line the pins of the button up and push it down gently until you hear a slight click. Then flip the board over and solder all four pins.

5

10uF Capacitor (decoupling cap): This part is polarized – make sure the white negative side of the capacitor goes into the hole of the board with the “-” marking.

6

100uF Capacitor (decoupling cap): This part is polarized – make sure the gold negative side of the capacitor goes into the hole of the board with the “-” marking.

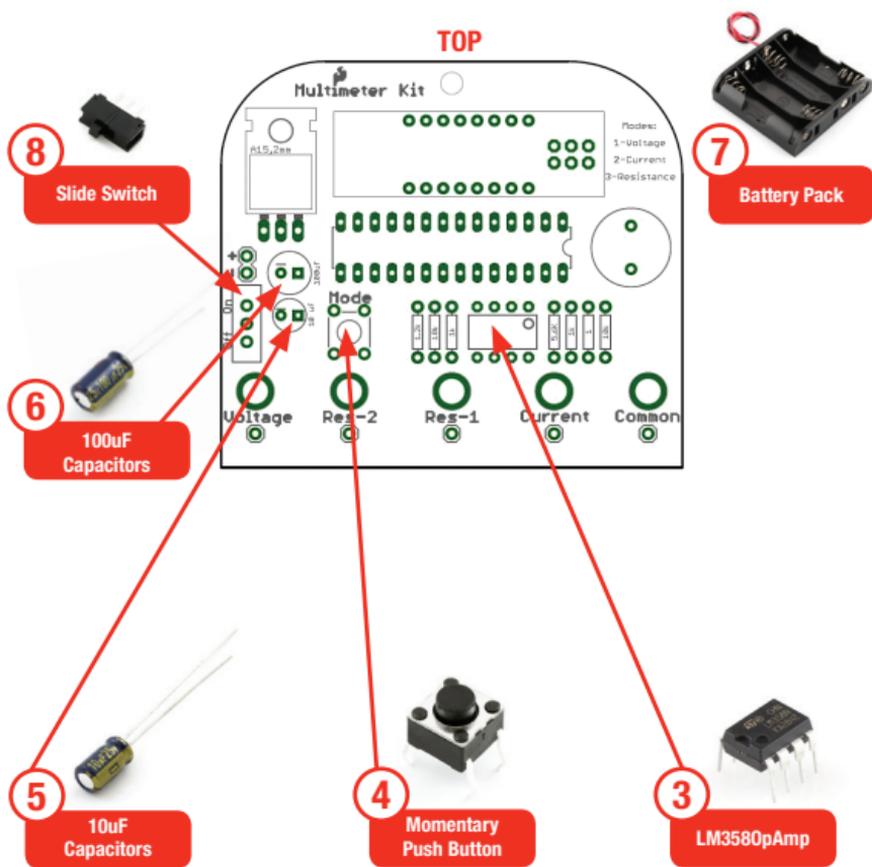
7

Battery Pack (power): Insert the red wire in to the pin labeled “+”, and the black into the “-” hole. Make sure the exposed parts of these wires have no chance to touch eachother!

8

Slide Switch (on/off switch): You can put this part in in either direction.

bottom side. After soldering each part, clip off each remaining leg; make sure to hold the leg while clipping it off. Also remember steps highlighted in yellow feature polarized components.



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9

Buzzer (noise-maker): You can put this part in in either direction.

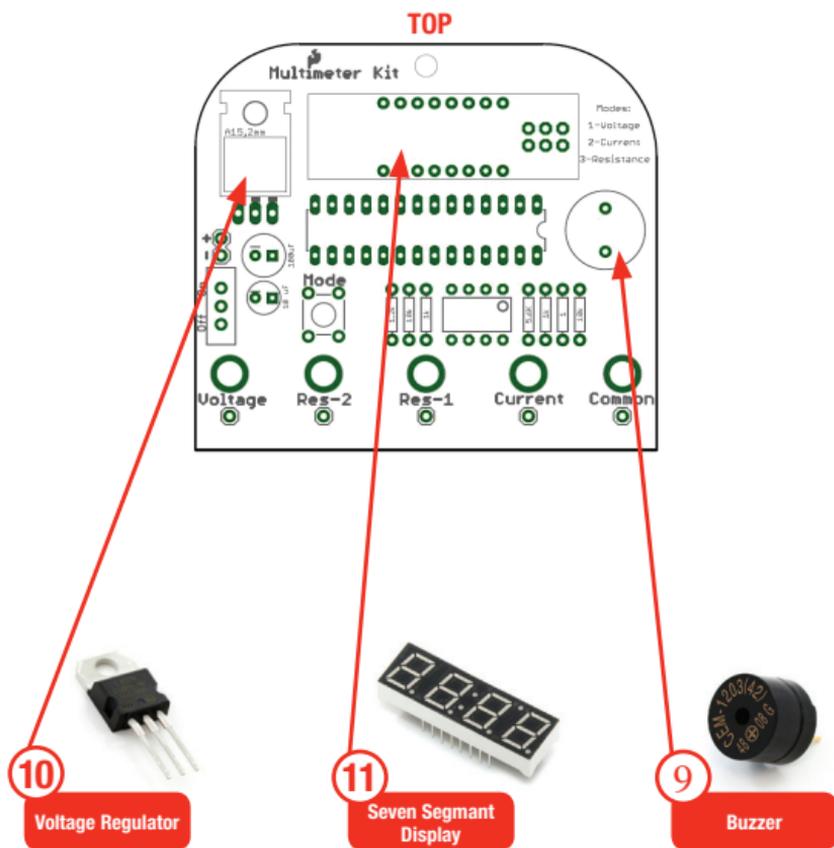
10

Voltage Regulator: Bend all three of the legs at a 90 degree angle, so they point toward the back of the chip (the metal side). Insert the regulator so it matches up with the white outline on the PCB; the metal side of the regulator should be touching the board. Solder the pins on the back of the board.

11

Seven Segment Display: This part is polarized – insert the display so the decimal points (there's one after every digit) are towards the bottom side of the board.

bottom side. After soldering each part, clip off each remaining leg; make sure to hold the leg while clipping it off. Also remember steps highlighted in yellow feature polarized components.



Tips and Hints

Microcontroller and PCB

The microcontroller is the brain of the multimeter. It's programmed to take the data provided by the probes and interpret it into something meaningful. Bending the legs won't hurt the chip – it is designed to withstand gentle bending as well as the heat of the soldering iron.

Try to be gentle with the board, but a few scratches are not a big deal.

Soldering

It is normal for the handle of the soldering iron to heat up a beat. Hold it like a pencil and move your hand further away from the tip if the heat is uncomfortable. The solder smokes because of the rosin inside the solder burning off – it's not harmful. If it bothers you, try using a small fan to blow it out of the way.

Buzzer and Other Components

The buzzer makes the noise for the multimeter – pretty simple! The capacitors help “clean up” the power on the board. The resistors tell the microcontroller not to reset once the power is turned on, so your multimeter doesn't shut down in the middle of testing.