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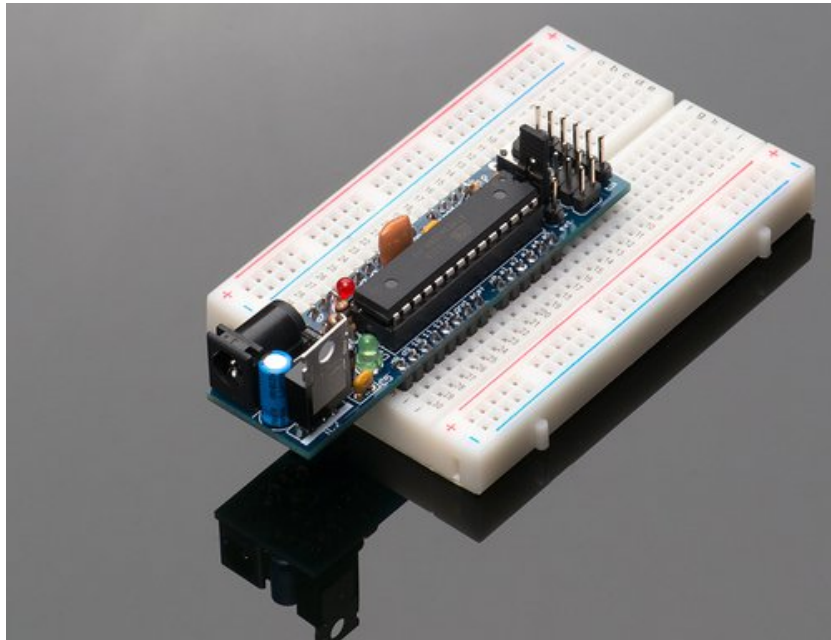
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



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DC & USB Boarduino Kits

Created by lady ada

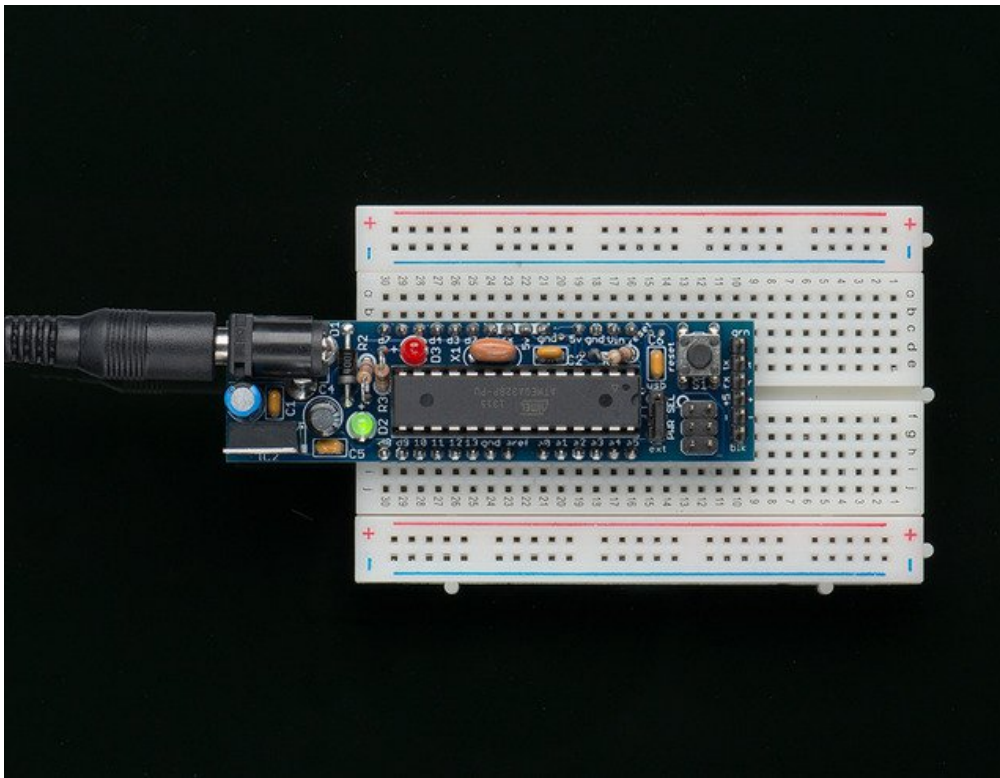


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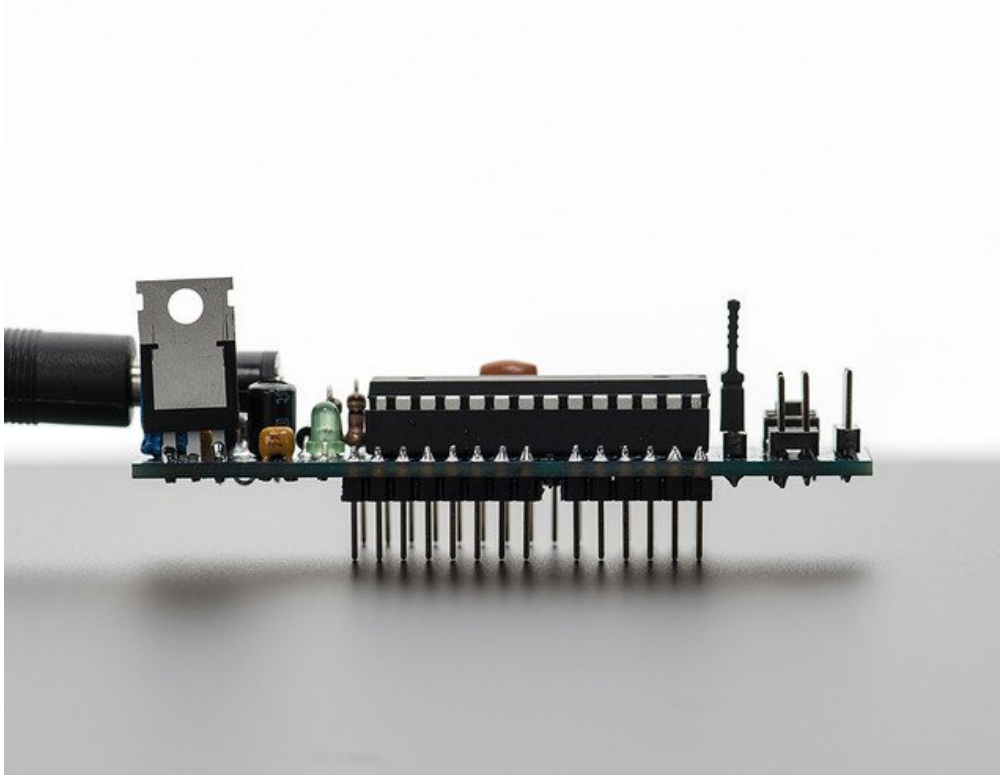
Guide Contents

| | |
|--|----|
| Guide Contents | 2 |
| Overview | 4 |
| Make It! | 7 |
| Steps | 7 |
| Preparation | 8 |
| Prep | 8 |
| (http://adafru.it/c06)Tools | 8 |
| DC Parts List | 12 |
| DC Boarduino Assembly | 14 |
| USB Parts List | 31 |
| USB Boarduino Assembly | 32 |
| Using with the Arduino IDE | 35 |
| About the Design | 35 |
| Microcontroller | 35 |
| Serial Converter | 35 |
| Fuse | 35 |
| RESET Button | 36 |
| LEDs | 36 |
| PWR Jumper | 36 |
| ISP Header | 36 |
| Downloads | 37 |
| Use It! | 38 |
| Using with the Arduino IDE | 38 |
| Using with a Breadboard | 38 |
| Adding USB with an FTDI cable | 38 |
| Arduino Compatibility | 39 |
| Programming | 41 |
| High Power | 41 |
| Ideas for Use | 43 |
| Use Terminal Blocks | 43 |
| Downloads | 45 |
| DC Boarduino | 45 |
| USB Boarduino | 45 |
| Resources | 46 |

Overview



If you've ever struggled to use a solderless breadboard with an Arduino, you understand how frustrating it can be! I designed this Arduino clone to solve this problem in an inexpensive DIY fashion. [Kits with all parts are available in the Adafruit webshop \(http://adafru.it/aJD\)](http://adafruit.com/products/1111).



The Boarduino is an Arduino clone: when programmed with the Arduino bootloader, it can talk to the Arduino software and run sketches just like the original.

There are noticeable differences between the Boarduino and the Arduino.

- Shields cannot be used as the form factor is so different
- There are two versions, a DC version and a USB version
For the DC version there isn't an on-board USB chip. This means you need to use a [USB-TTL](http://adafru.it/c02) (http://adafru.it/c02) cable or a [MiniUSB](http://adafru.it/c03) (http://adafru.it/c03) (or any other FTDI breakout board) which is not included. There are also no rx/tx LEDs and no rx/tx 1K series resistors.
For the USB version, there is an on-board USB chip but there isn't a DC jack or 5V regulator, you can power it through the USB jack. There is a rx 1K resistor so you can use this to talk to serial accessories.
- 16.00 MHz ceramic resonator is used instead of crystal, so cycle speed may be off by +/- 0.3nS (0.5%). This isn't relevant for UART timing, servo drivers, PWM, etc. but could be an issue if you need nanosecond-precision timing. Note that the Arduino software only provides millisecond-precision timing for general sketches (1 second = 1000ms. 1ms = 1,000,000 ns)

The specifications for the DC boarduino include:

- Designed to plug into a breadboard for easy prototyping
- Petite size, only 3" x 0.8" (75mm x 20mm)
- All 'standard' pins are brought out - Digital 0 thru 13, Analog 0 thru 5, ARef, 5V, Ground, Vin and Reset
- 2 LEDs, green power and red "pin 13" LED just like the Arduino Diecimila
- Standard Reset button
- ATmega328P, running at 16.00 MHz, just like the latest Arduino, the Duemilanove (note that the product photo above hasn't been updated)
- 6-pin standard ICSP header
- Standard 2.1mm DC jack (just like the original Arduino) with 5V regulator to run on 7V-17V power (DC)
- USB or External power, selectable with a jumper (just like original Arduino)
- 1N4001 diode protects against using incorrect wall adapter
- 6-pin header at the end for a [USB-TTL cable](http://adafru.it/aIH) (http://adafru.it/aIH)

- Auto-reset capability when used with a [USB-TTL cable \(http://adafru.it/aIH\)](http://adafru.it/aIH)
- Available as a low cost kit with standard parts, so its never out of stock
- All through-hole parts are easy to solder

The specifications for the USB boarduino include:

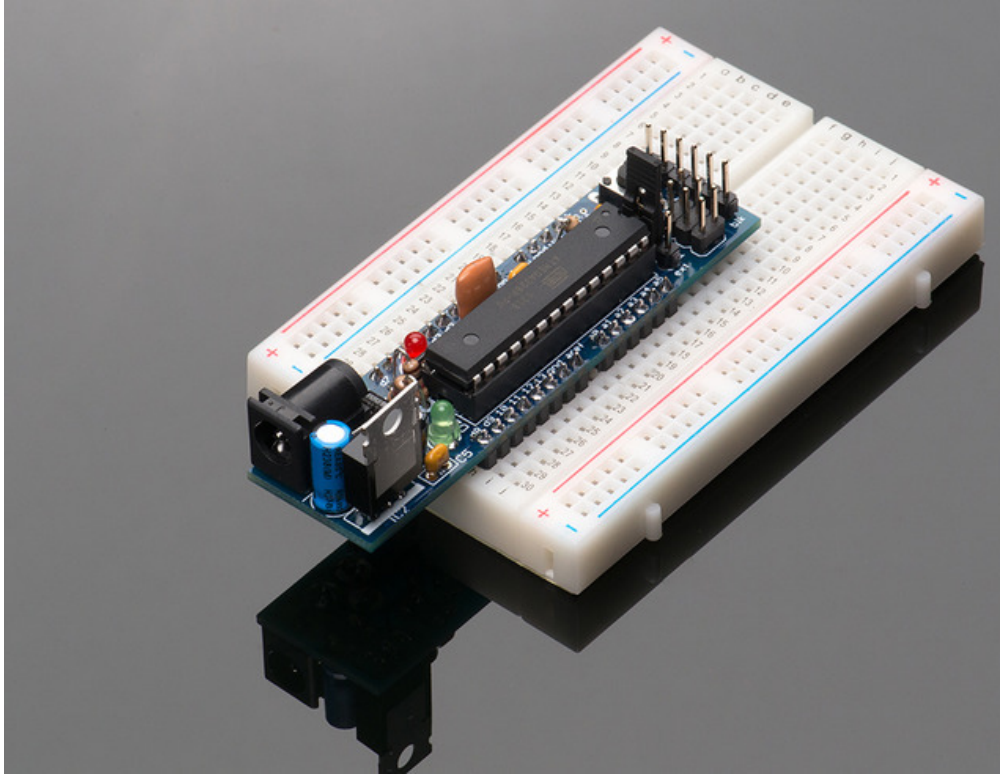
- Designed to plug into a breadboard for easy prototyping
- Petite size, only 2.75 " x 0.8" (75mm x 20mm)
- All 'standard' pins are brought out - Digital 0 thru 13, Analog 0 thru 5, ARef, 5V, Ground, 3.3V and Reset
- 2 LEDs, green power and red "pin 13" LED just like the Arduino Diecimila
- Standard Reset button
- ATmega328, running at 16.00 MHz, just like the Duemilanove
- 6-pin standard ICSP header
- Standard mini-USB jack
- USB or external power, selectable with a jumper
- 500mA fuse protects your computer from current overdraw
- Auto-reset capability
- Available as a low cost kit with standard parts, so its never out of stock
- All through-hole parts are easy to solder - SMT chip is presoldered & tested when purchased as a kit

[If you have a USB boarduino check this page for instructions!\(http://adafru.it/cjT\)](http://adafru.it/cjT)

Make It!

Steps

This is a very easy kit to make, just go through each of these steps to build the kit.



Preparation

Prep

[Learn how to solder with tons of tutorials](http://adafru.it/aTk)(<http://adafru.it/aTk>)!
[Don't forget to learn how to use your multimeter too](http://adafru.it/aOy)(<http://adafru.it/aOy>)!

(<http://adafru.it/c06>)Tools

There are a few tools that are required for assembly. None of these tools are included. If you don't have them, now would be a good time to borrow or purchase them. They are very very handy whenever assembling/fixing/modifying electronic devices! I provide links to buy them, but of course, you should get them where ever is most convenient/inexpensive. Many of these parts are available in a place like Radio Shack or other (higher quality) DIY electronics stores.



Soldering iron

Any entry level 'all-in-one' soldering iron that you might find at your local hardware store should work. As with most things in life, you get what you pay for.

Upgrading to a higher end soldering iron setup, like the [Hakko FX-888 that we stock in our store](http://adafru.it/180) (<http://adafru.it/180>), will make soldering fun and easy.



Do not use a "ColdHeat" soldering iron! They are not suitable for delicate electronics work and can damage the kit ([see here](http://adafru.it/aOo) (<http://adafru.it/aOo>)).

[Click here to buy our entry level adjustable 30W 110V soldering iron.](http://adafru.it/180) (<http://adafru.it/180>)

[Click here to upgrade to a Genuine Hakko FX-888 adjustable temperature soldering iron.](http://adafru.it/303) (<http://adafru.it/303>)

Solder

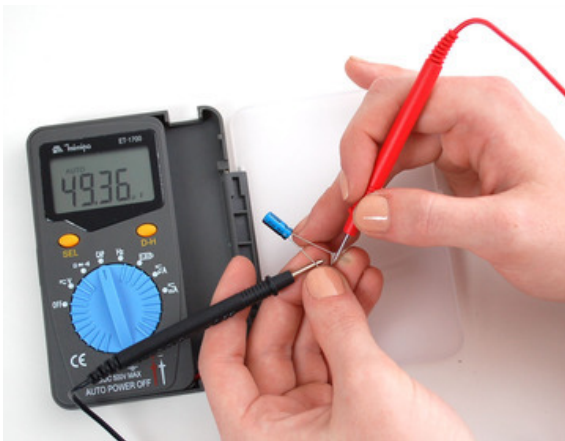
You will want rosin core, 60/40 solder. Good solder is a good



thing. Bad solder leads to bridging and cold solder joints which can be tough to find.

[Click here to buy a spool of leaded solder \(recommended for beginners\).](http://adafru.it/145) (<http://adafru.it/145>)

[Click here to buy a spool of lead-free solder.](http://adafru.it/734) (<http://adafru.it/734>)



Multimeter

You will need a good quality basic multimeter that can measure voltage and continuity.

[Click here to buy a basic multimeter.](http://adafru.it/71) (<http://adafru.it/71>)

[Click here to buy a top of the line multimeter.](http://adafru.it/308) (<http://adafru.it/308>)

[Click here to buy a pocket multimeter.](http://adafru.it/850) (<http://adafru.it/850>)



Flush Diagonal Cutters

You will need flush diagonal cutters to trim the wires and leads off of components once you have soldered them in place.

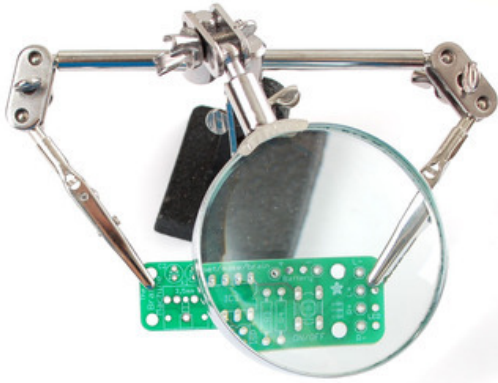
[Click here to buy our favorite cutters.](http://adafru.it/152) (<http://adafru.it/152>)



Solder Sucker

Strangely enough, that's the technical term for this desoldering vacuum tool. Useful in cleaning up mistakes, every electrical engineer has one of these on their desk.

[Click here to buy a one.](http://adafru.it/148) (<http://adafru.it/148>)



Helping Third Hand With Magnifier










Not *absolutely* necessary but will make things go much much faster, and it will make soldering much easier.










[Pick one up here.](http://adafru.it/291) (<http://adafru.it/291>)



DC Parts List

Check to make sure your kit comes with the following parts. Sometimes we make mistakes so double check everything and email support@adafruit.com if you need replacements!

| Image | Name | Description | More Info | Qty |
|---|----------------------------|--|--|--------------|
|  | IC1 | Microcontroller (preprogrammed with Arduino bootloader when purchased in a kit). | ATmega328P-20PU (unprogrammed) Adafruit (Programmed) | 1 |
|  | IC1' | 28-pin socket | 28 pin socket | 1 |
|  | X1 | 16.00 MHz ceramic oscillator | 16 mhz ceramic resonator | 1 |
|  | D1 | 2.1mm Power Jack | CUI PJ-202AH | 1 |
|  | IC2 | 1N4001 diode | Generic 1N4001 | 1 |
|  | IC2 | 5V regulator 7805 TO-220 package | 7805 | 1 |
|  | C1 C2 C5 C6 (opt) | Bypass capacitor | Ceramic Capacitor | 3 or 4 |
|  | C3 | Electrolytic capacitor 47uF / 25V (or higher) | Electrolytic Capacitor | 1 |
|  | C4 | 100uF/6.3V capacitor (or higher) (the image shows a 10V but 6.3V is fine) | Electrolytic Capacitor | 1 |
| | | 10K ohm 1/4W 5% resistor | | |

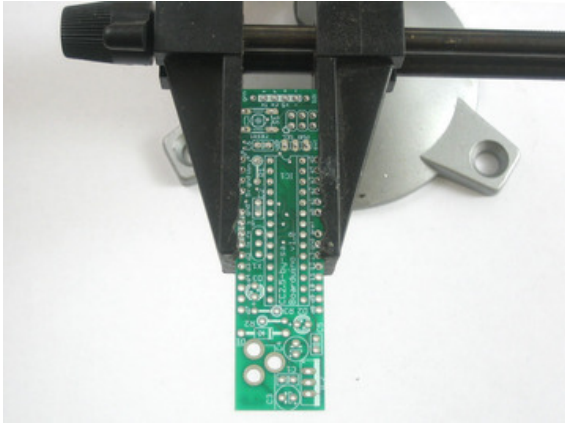
| | | | | |
|---|----------|---|--|---|
|  | R1 | (brown black orange gold) 1.0K 1/4W 5% | Generic Resistor | 1 |
|  | R2 R3 | resistor (brown black red gold) | Generic Resistor | 2 |
|  | D3 | 3mm red LED | 3mm red diffused | 1 |
|  | D2 | 3mm green LED | 3mm green diffused | 1 |
|  | SW1 | 6mm tact switch button | 6mm tact switch | 1 |
|  | ICSP | 6 pin header, 0.1"x0.1" spacing | 2x3 pin header | 1 |
|  | | 40 pin male header, 0.1" spacing | 0.1" male header strip | 1 |
|  | | Jumper | | 1 |
|  | PCB | Circuit board | Adafruit Industries | 1 |

DC Boarduino Assembly

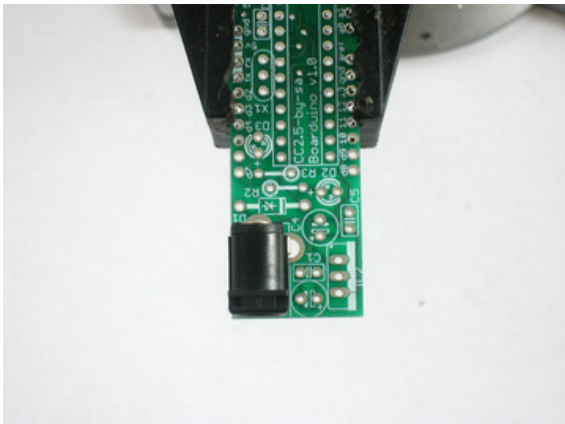
The first step is to solder the kit together. If you've never soldered before, [check the Preparation page for tutorials and more](http://adafru.it/cjF) (<http://adafru.it/cjF>).

[If you have a USB boarduino check this page for instructions!](http://adafru.it/c04)(<http://adafru.it/c04>)

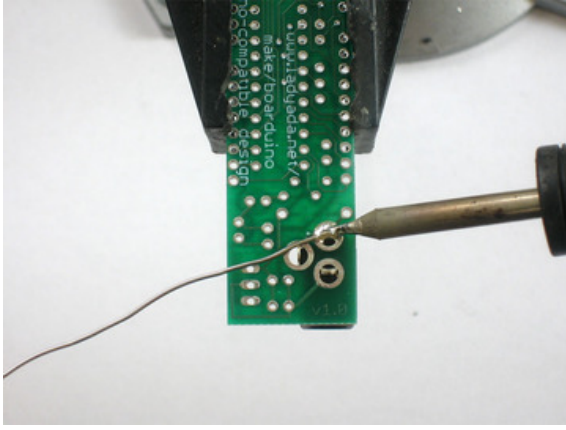
Check the kit to verify you have all the parts necessary, then get your tools ready! A board vise, soldering iron & solder, diagonal cutters, and a solder sucker (desoldering tool) if you have one.



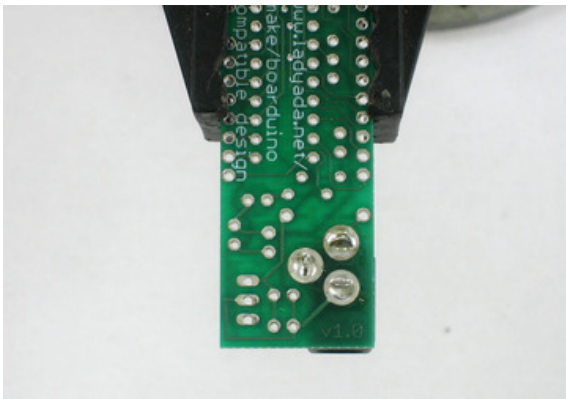
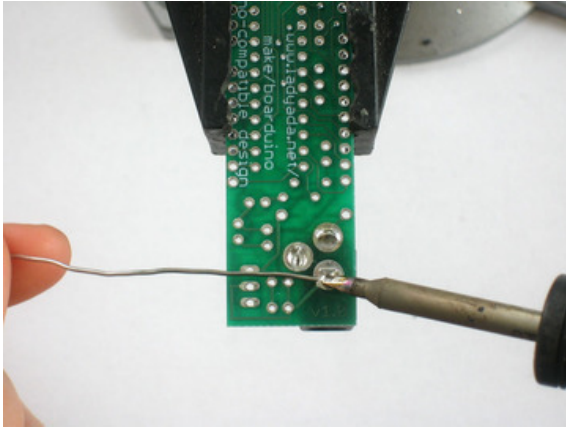
Place the PCB in a vise to make soldering easy!
Heat up the soldering iron to 700 degrees, tin it if necessary.
Make sure the sponge is wetted.



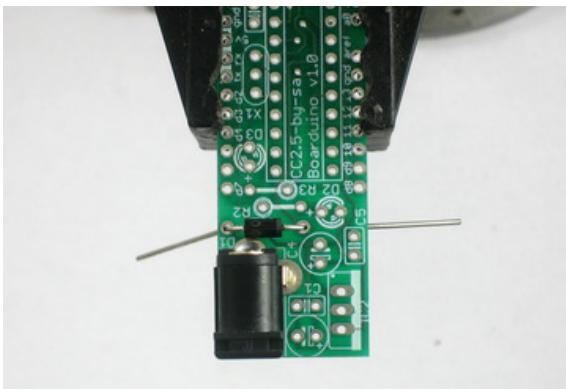
Place the 2.1mm DC jack as shown, it should fit in snugly.
Make sure the part is on the top of the board, so that you can see the silkscreened images.



Use the soldering iron to heat up each of the 3 connections and poke the solder in so that it melts into the holes.

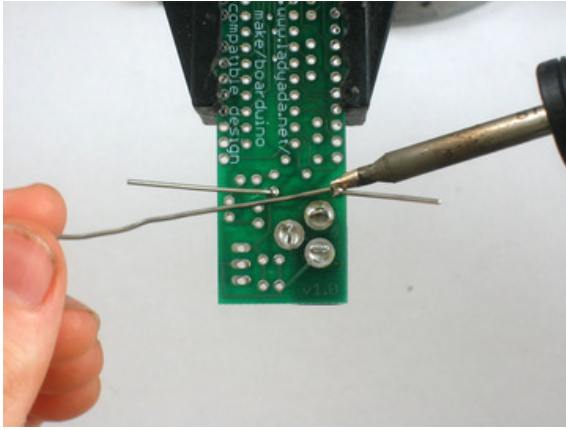
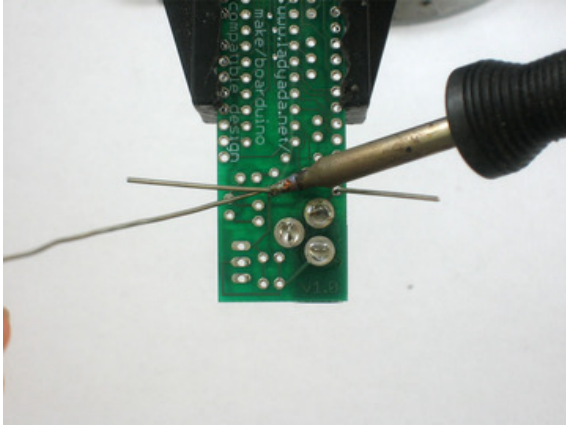


Make sure all three pads are soldered, with plenty of solder, the holes should be filled up. This gives the jack mechanical strength.

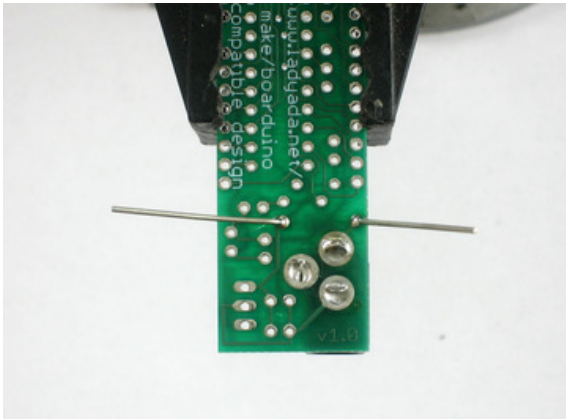


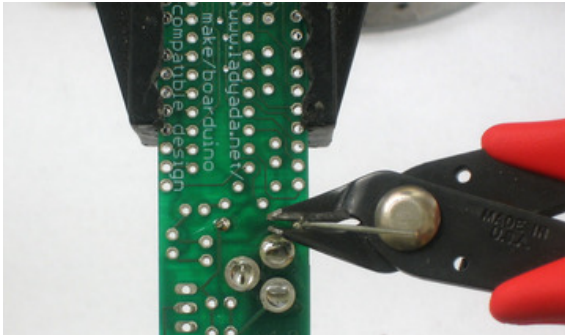
Next, place the 1N4001 diode **D1** . Diodes are directional, they only let current flow in one direction. This diode is used to protect the Boarduino from damage. Make sure the white stripe on the diode matches the white stripe in the silkscreened image below. In this picture, the stripe is on the right.

You can bend the leads a bit which will keep the part from falling out when you turn the board over.

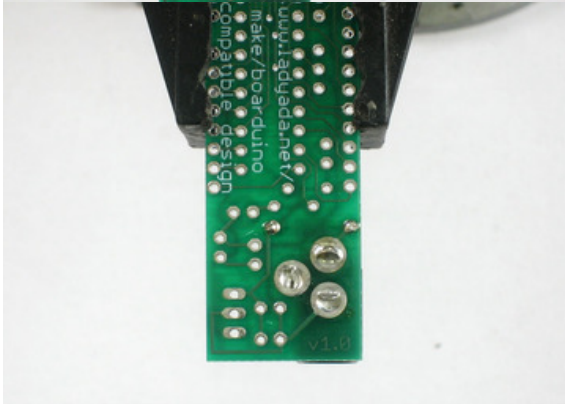


Turn the PCB over and solder both legs so that you get a nice shiny solder joint.

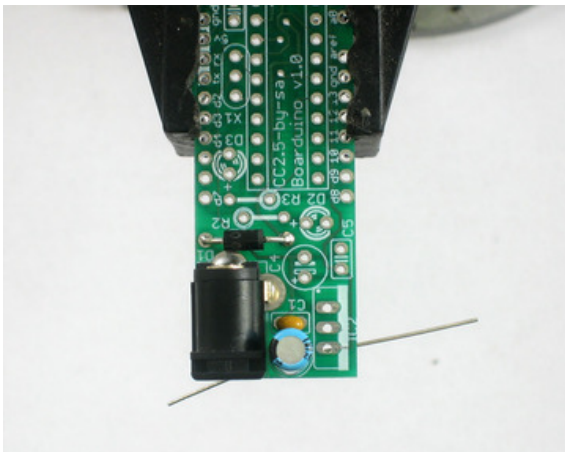
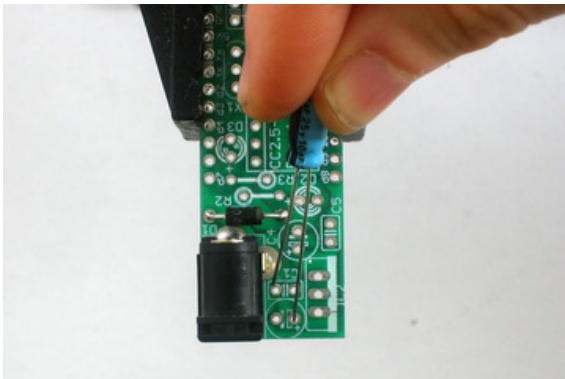




Use the diagonal cutters to clip off the long leads, leaving just a bump.

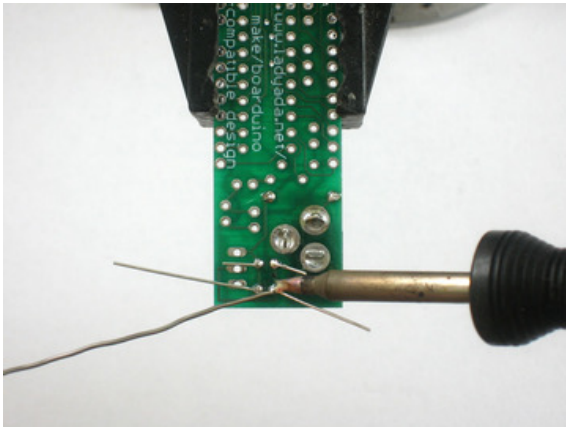


It should look like this.



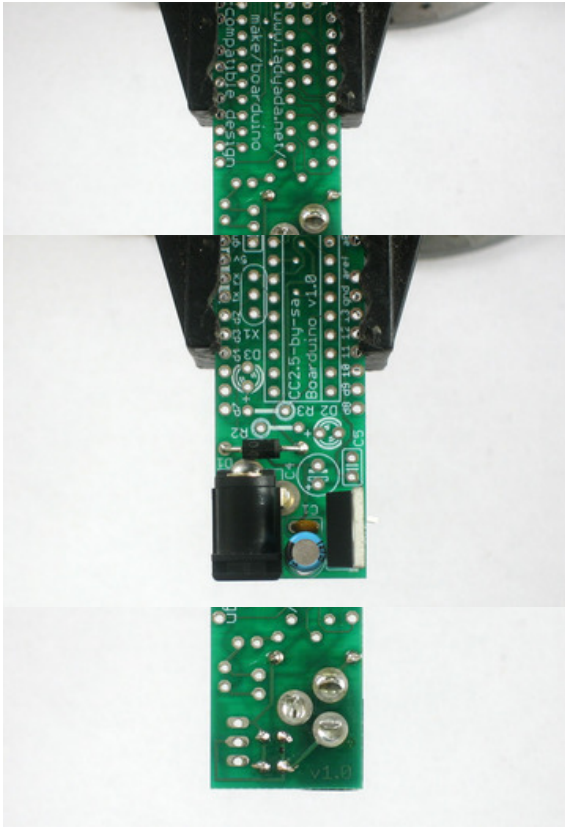
Next, its time to place the 25V electrolytic capacitor **C3**. Electrolytic capacitors are *polarized* which means they only work well in one direction. Put it in backwards and they can explode! You can tell how to place it because the silkscreened image has a plus near one hole and the capacitor has one long lead. That lead is the positive lead. In this image, its the one on the right.

Also insert **C1** which is a ceramic capacitor. Ceramic capacitors are non-polarized so you don't have to worry about putting it backwards.



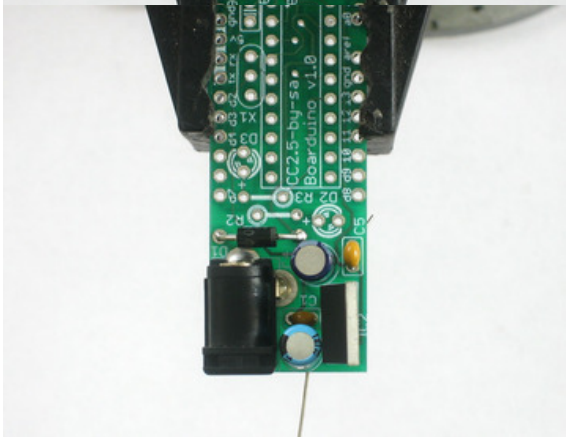
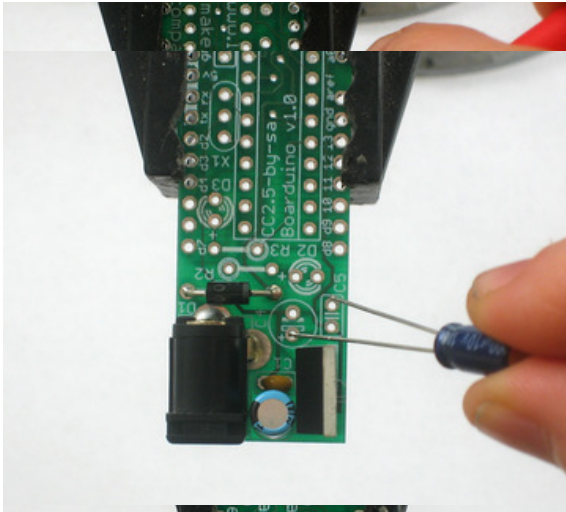
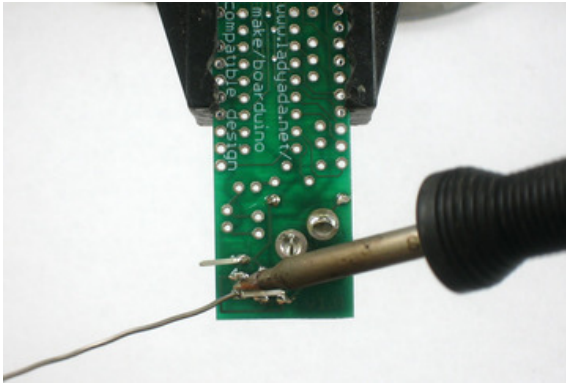
Solder all 4 leads.

And clip them short with the cutters.



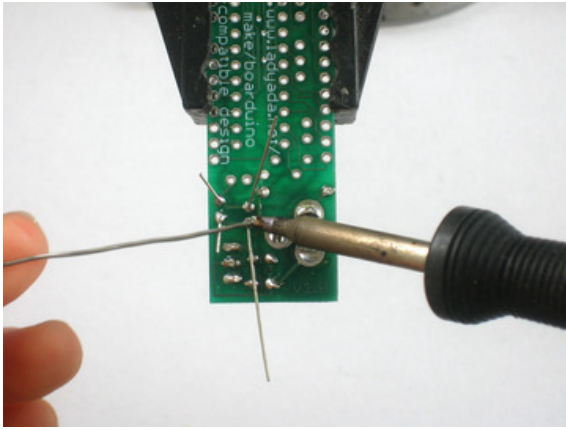
Next is the 5V regulator. This takes the power from the DC jack which may be something like a 9V battery, and brings it down to 5V, which is suitable for the microcontroller chip. This part must be placed as shown, with the metal heat sink tab on the right.

Turn over the board and solder all three pins, then clip them off.

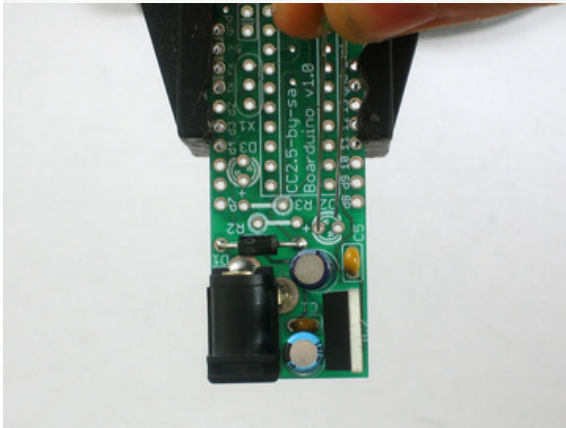
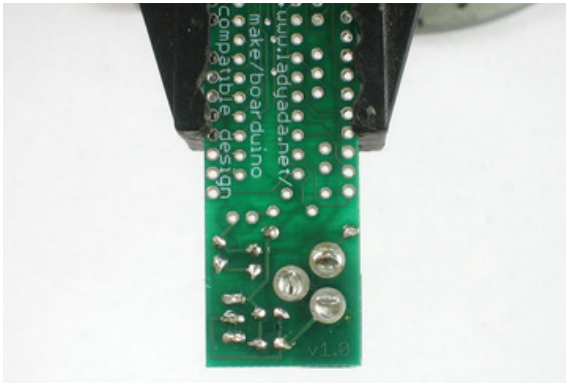


Now you should solder in the 6.3V electrolytic capacitor **C4** as shown. Remember its polarized so you must place the longer lead in the positive-marked hole.

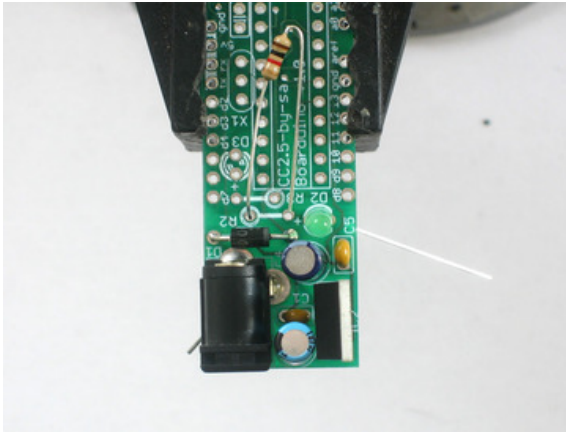
Then place the ceramic capacitor **C5**.



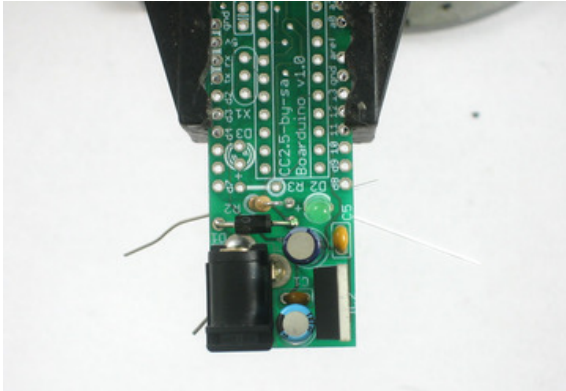
Solder in the capacitors and clip them.



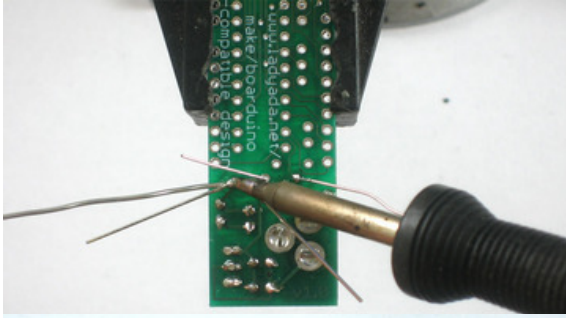
Next is the green 3mm LED **D2**. Like the electrolytic capacitors, LEDs have polarity and they won't work if soldered in backwards. The long lead is the positive lead, make sure it goes in the hole with a + next to it.



The 1K resistor **R2** goes in, its the LED's matching resistor. Bend it over as shown to place it.



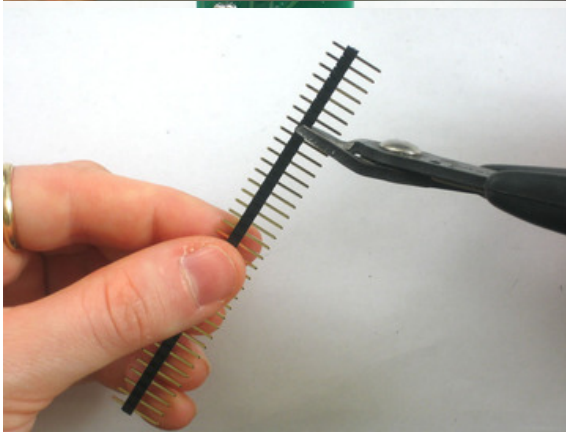
Solder in the resistor and LED and clip the leads.



•



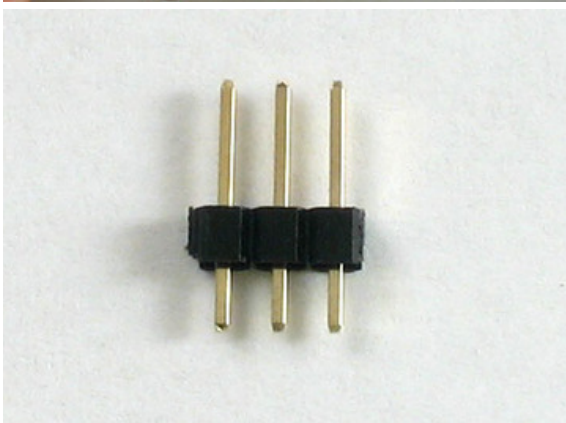
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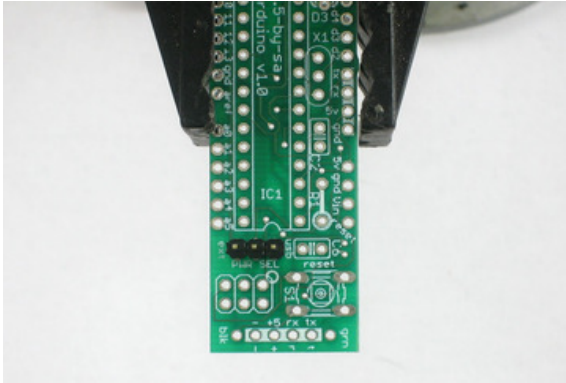
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Next you have to make a 3-pin header.

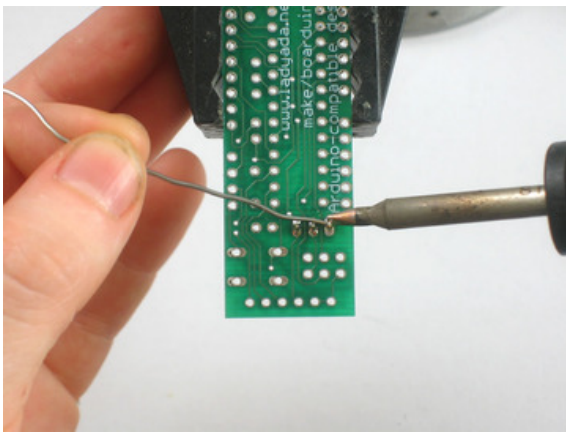
Use the diagonal clippers or a pair of pliers to break apart the single row header.



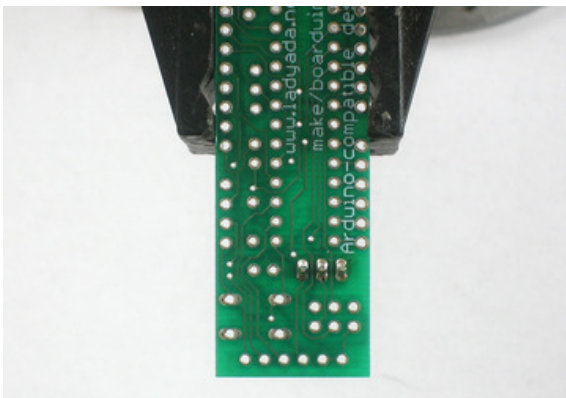
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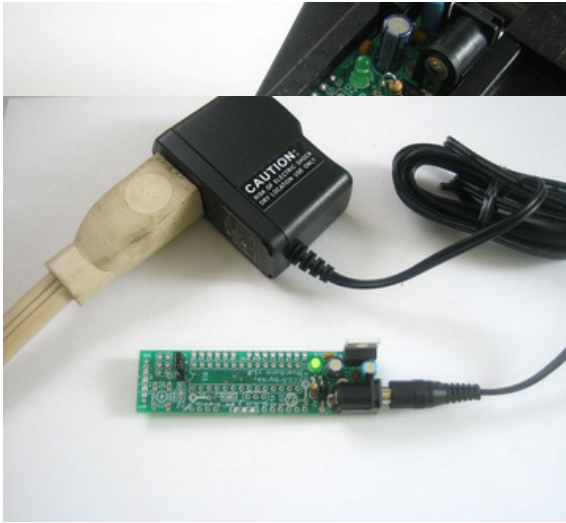
Place the 3 pin header at the other end of the board as shown. the short end goes into the PCB, and the long ends extend up.



Solder the jumper header in place. You won't need to clip because the leads are short already!



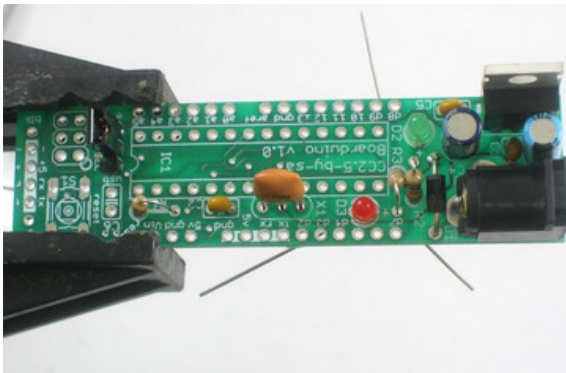
Place the jumper/shunt as shown, so that its on the **EXT** pair of pins.



Take the board out of the vise and plug in a power source such as a 9V DC positive-tip wall adapter or a 9V battery with a 2.1mm barrel jack. You should see the green LED light up.

If no LED lights up check:
 Is the battery or wall adapter good?
 Is it positive tip?
 Is the diode in correctly?
 Is the LED in correctly?
 Are all the parts in place?

I don't suggest continuing if you can't get the green LED to light as it indicates a problem!



Place the red LED **D3**, taking care to make sure the long lead is in the positive-marked hole. Also place the matching 1K resistor **R3**

Also place the 16.00MHz ceramic oscillator **X1** (which is non-polarized) the third ceramic capacitor **C2** and the 10K resistor **R1**