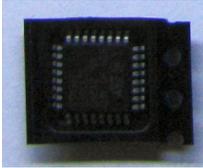
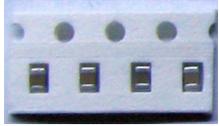
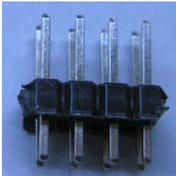
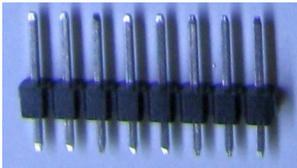
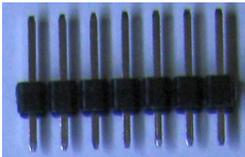
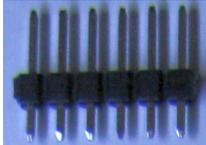
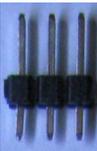


Ruxcon Hardware Hacking Village 2016

RuxBadge instruction sheet

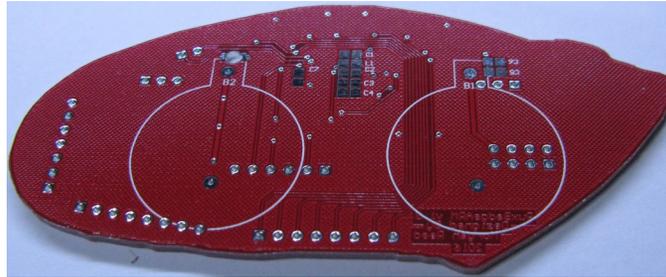
Bill of materials;

Qty	Description	Designators	Image
1	STM32F030K6T6 32-bit Microcontroller	U1	
1	TSSP58038 IR Receiver	U2	
1	940nm IR Emitter	D1	
8	Green LED (0805 SMD)	D2-9	
9	82R Resistors (0805 SMD, black, marked 820)	R1-9	
1	10k Resistor (0805 SMD, black, marked 103)	R10	
1	11R Ferrite Bead (0805 SMD, black, unmarked)	L1	
4	100nF MLC Capacitor (0805 SMD, brown/tan, unmarked)	C1, C2, C5, C7	
1	1uF MLC Capacitor (0805 SMD, brown/tan, unmarked, RED packaging)	C3	
1	4u7F MLC Capacitor (0805 SMD, brown/tan, unmarked, BLUE packaging)	C6	
1	10uF MLC Capacitor (0805 SMD, brown/tan, unmarked, BLACK packaging)	C4	

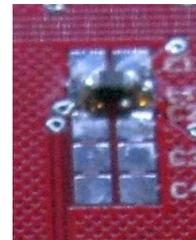
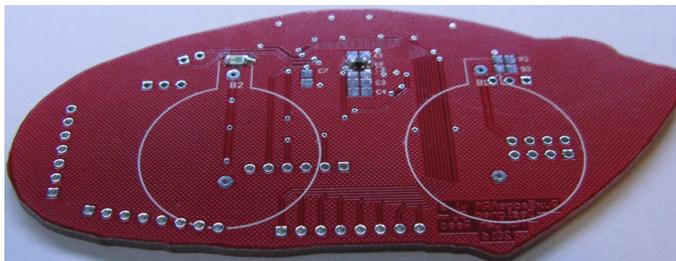
Qty	Description	Designators	Image
1	2x4 DIL Header	P6	
2	8-way SIL Header	P3, P4	
1	7-way SIL Header	P2	
1	6-way SIL Header	P5	
1	3-way SIL Header	JP1	
1	2-way SIL Header	P1	
1	Jumper Shunt	N/A	
2	CR2032 Battery Holders	B1, B2	

NOTE: There are a few bits of muppetry in this design as well (though not nearly to the same degree as SimpleSolder) so read the instructions carefully.

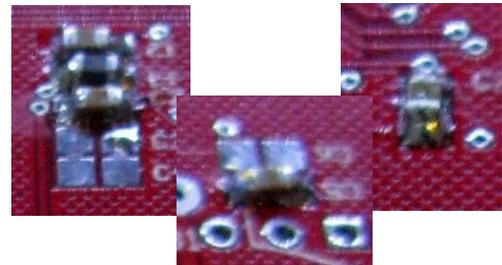
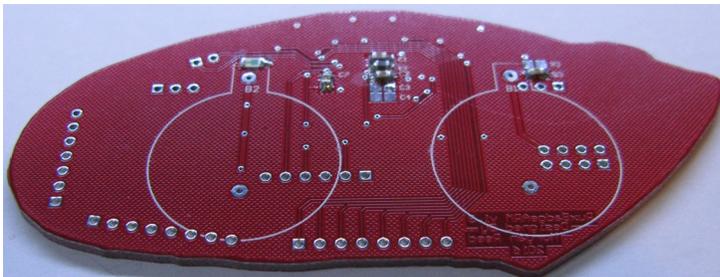
These instructions will be a lot less verbose than the ones for SimpleSolder as it's expected that you've probably grasped the basics. If you have any issues feel free to talk to one of the HHV staff.



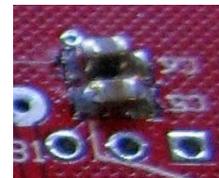
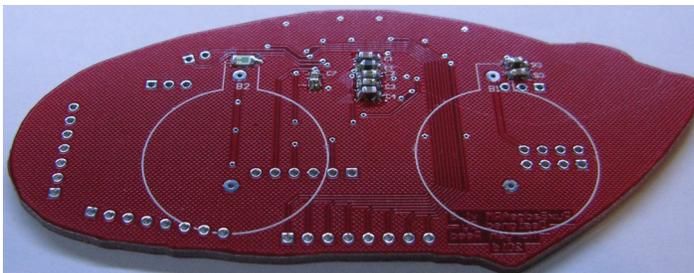
0. We are going to be mounting parts on BOTH sides of the board for this project, so we'll start with the SMD parts on the back side.



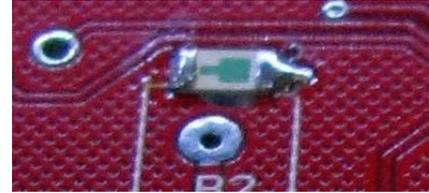
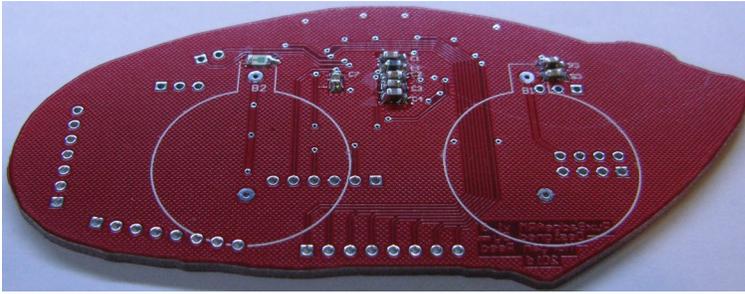
1. First we'll mount L1, it's the dark grey/black device with no markings. Follow the normal procedure, tin pad, place part, flow solder onto one end, solder other end.



2. Next mount the 100nF Capacitors, C1, C2, C5, C7. These are the four brown/tan parts with no markings. Note that there are three separate locations these parts are in.



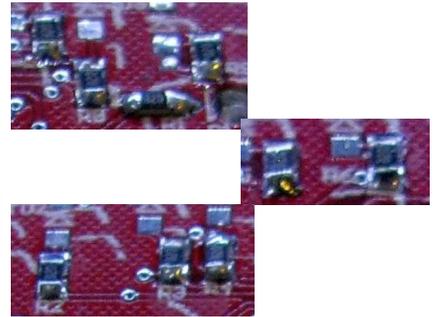
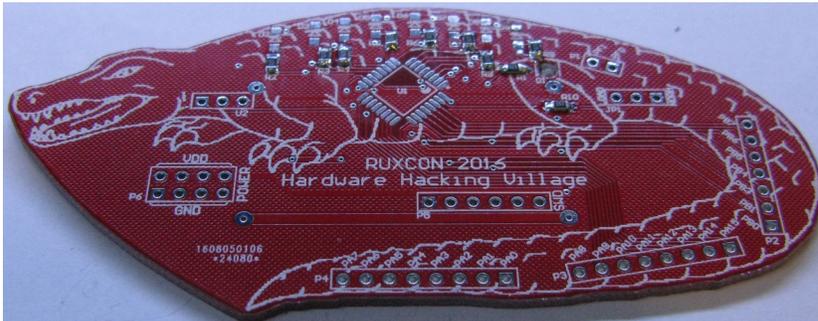
3. Next we'll place the 1uF, 4u7F and 10uF capacitors. These all look pretty much identical so we've colour coded them in the kits, (C3 - 1uF – Red, C6 - 4u7F – Blue, C4 - 10uF – Black). Do them one at a time to save confusion.



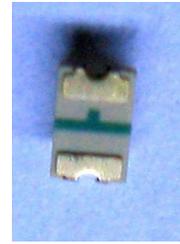
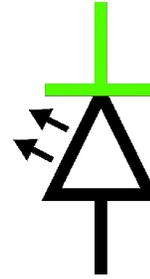
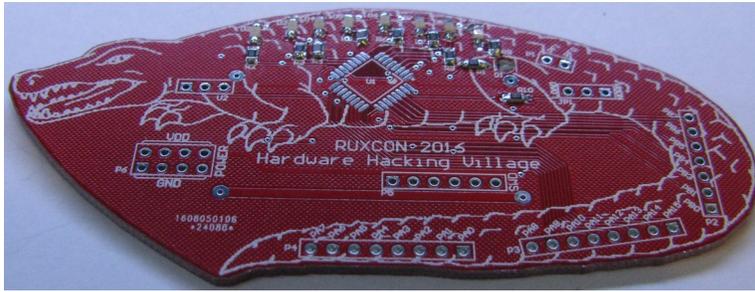
4. Finally, we'll mount the IR emitter. Ensure that it's oriented correctly (look at the right hand photo above). Note; this is a "through board" emitter, so what you're seeing is the back of the LED. The clear lens obviously faces into the hole.



5. Now we move onto the top of the board. First we'll mount the 10k Resistor R10. Notice the marking 103, and also the fact that the resistor is "dressed" such that it reads correctly with when the board markings are the right way around.

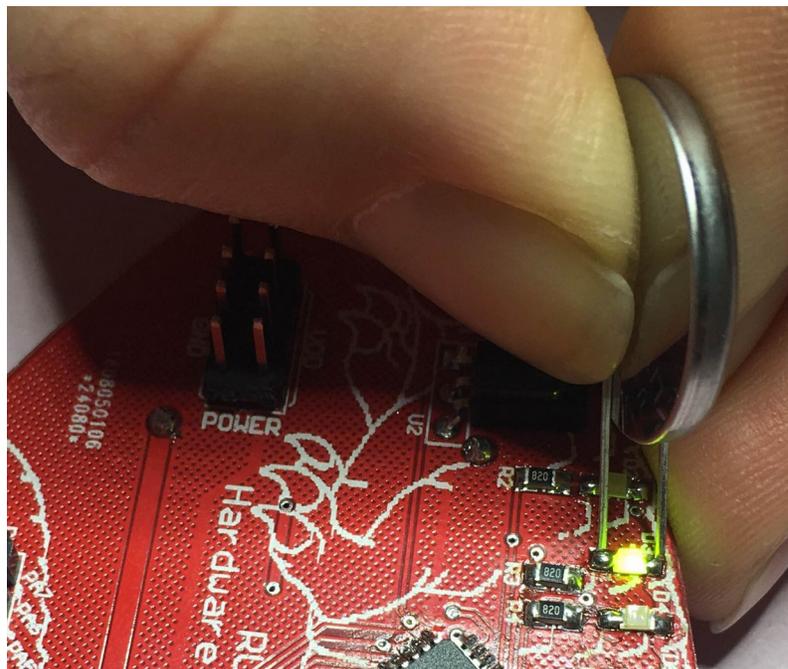
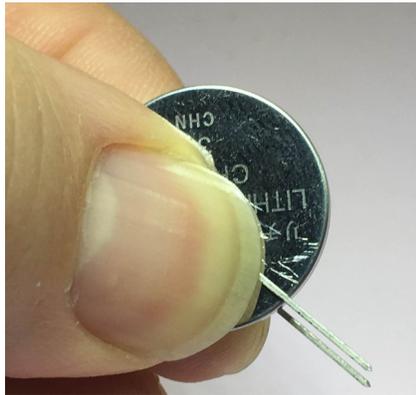


6. Next we'll mount the 9 82R resistors R1-9. Notice the marking 820 (which if I were a better photographer, would also be visible in the photos).

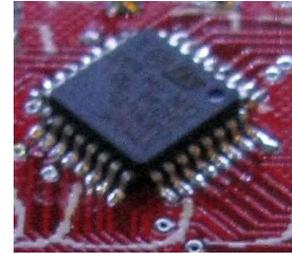
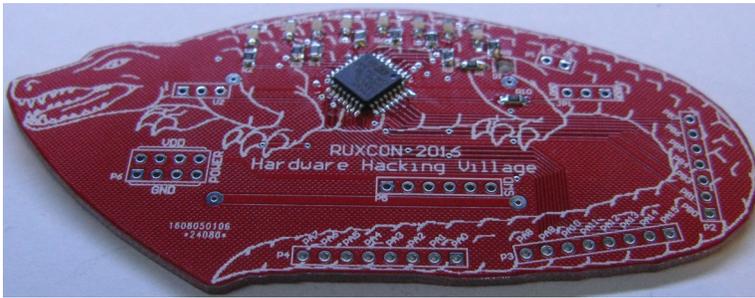


7. Next the Green LEDs D2-9. Once again these are 2512 (0805) parts on a 3216 (1206) footprint, so you'll have to do the “bridging” trick from SimpleSolder again.

At least the markings on these LEDs are the right way around... The highlighted part of the symbol above corresponds to the “T” shaped marking on the BACK of the LED (note this is the reverse of the SimpleSolder), and corresponds to the markings on the board once again.



7a. You may find it useful to test each LED as you mount it to ensure it's A) the right way around and B) actually connected. The way I do this is to take a couple of “pigtailed”, and pinch them on either side of the battery then touch the ends (briefly) to the solder pads on either side of the LED. The LED should illuminate when the “+” side of the battery is facing “inwards”.

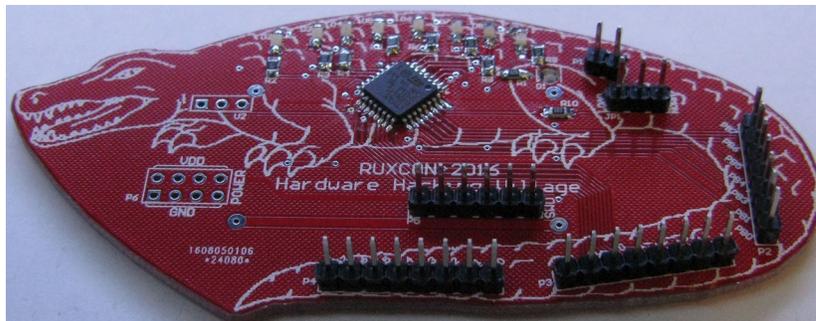


8. Next we'll deal with the microcontroller. It is VERY important that you orient the micro correctly (because it's a pain to de-solder and re-solder and you'll likely fry it anyway). Note the “dot” in one corner of the package. This “dot” corresponds to the “dot” on the PCB overlay, and should be facing to the right when the board is oriented as shown in the above photo.

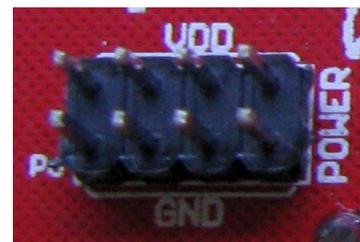
The easiest way to mount this is to tin either a single pad, or two pads on opposing sides, place the micro, then touch each tinned pad with your iron to flow the solder. This will hold it in place while you make the other connections. There are various approaches you can take here, but the easiest for the novice is probably to touch each lead with your soldering iron, apply a bit of downward pressure, then apply just a touch of the fine solder to the joint.

It is likely that you will bridge some of the pins on the micro together. The way to deal with this is to; apply a good amount of flux from one of the supplied flux pens, then place the thinner solder wick so that the end is sitting against the bridged pins, and apply your soldering iron. The solder wick will “suck up” the excess solder. There will most likely still be enough solder to make a connection left but in some cases it may be necessary to apply a touch more.

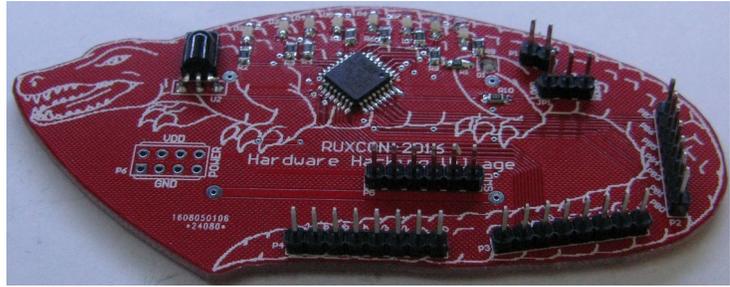
If you're struggling with this part feel free to grab one of the HHV staff for assistance.



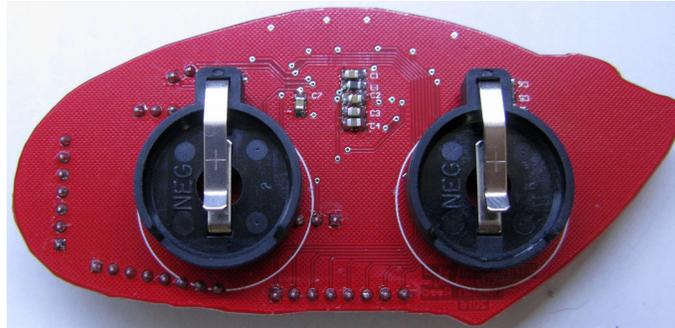
9. Install the SIL headers. Stick them where they fit (Note that JP1 is the 3-pin header), then solder the pins on the back of the board.



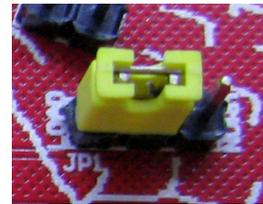
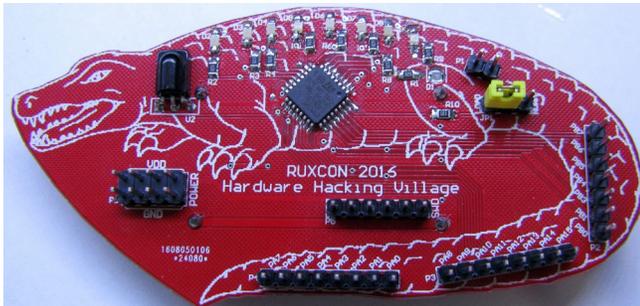
10. Install the DIL header. Once again, stick it where it fits, flip the board over and solder it in place.



11. Next we'll place the IR receiver. Bend its leads back at 90 degrees close to the body (as in the left-hand photo above). Insert it into the board as shown on the right, flip the board over, solder the three pins and trim the leads close to the board.



12. Next, we need to install the two CR2032 battery holders B1 and B2. The overlays on the back side of the board should make it easy to get them around the right way. The holes for these are a little small so you'll need to use a bit of "persuasion" to get them in place. Once they've "snapped" into place, solder the four pins on the front of the board, optionally trim them a bit afterwards.



13. In the final step in construction, install the Jumper Shunt on JP1 so that it's in the position shown above (note the markings on the board are reversed to what they should be. The "LOAD" position is "normal" boot from flash, the "NORM" position activates the UART-based bootloader).

WARNING: Be careful when installing the batteries. It's not unusual for the "+" and "-" contacts of the battery holder to end up being in contact with one another. Since the battery holders are in parallel, this could be bad as it may short out one of your batteries as you install it. Before installing either battery, bend the "+" contact of both holders up a little bit to ensure it's not in contact with the "-" contact.

When you install your batteries, it will be very anti-climactic as nothing will happen... The micro is not yet programmed. It needs the firmware loaded onto it. See the HHV staff for assistance with this step.

