Motion Triggered Sconce Light – Circuit Construction

This document describes how to build the circuit for a motion triggered sconce light. It uses a PIR motion detector, a transistor and some resistors. It was decided to build the circuit as simple as possible to reduce the cost and the number of parts.

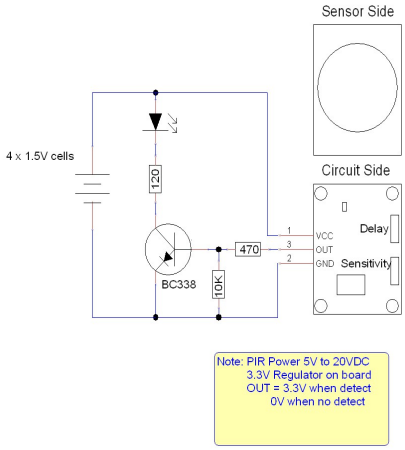
There are two parts to this project :-

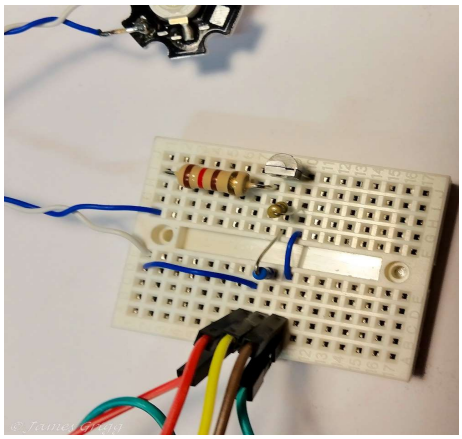
1. breadboard, which is not reliable but reduces the need for a solderstation, etc.
2. vero board with soldered parts, the result is not much bigger than the PIR.

This document describes only the circuit board version.

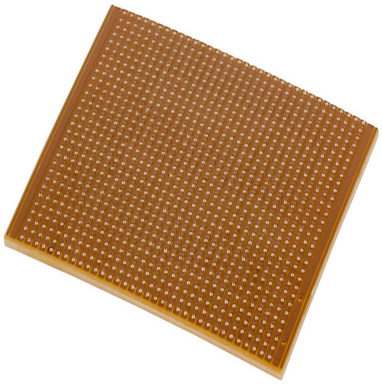
Design

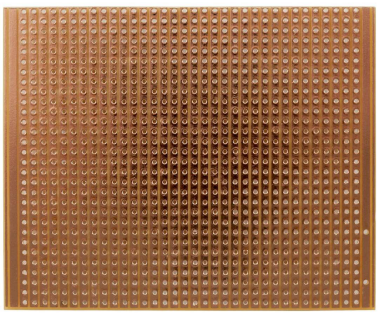
Part one described the circuit design and testing via a breadboard.



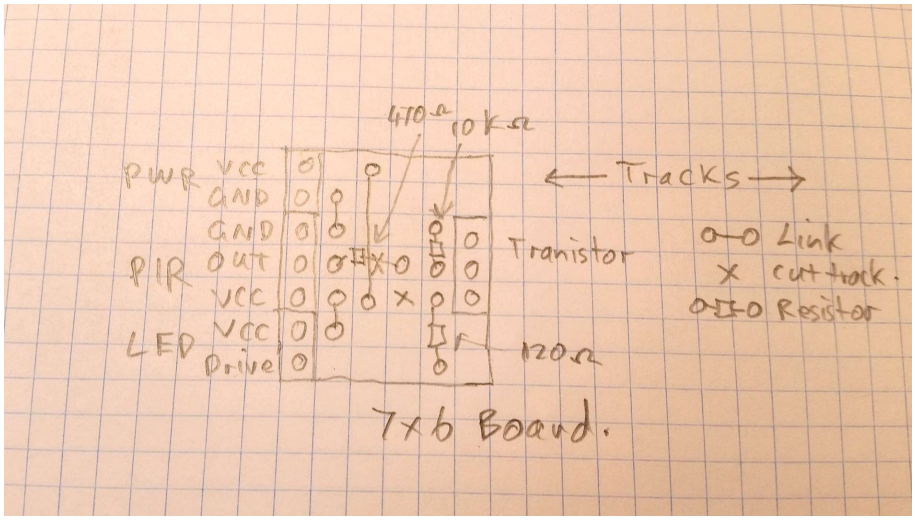


This part builds the circuit on a small piece of vero board. The vero board has tracks running in one direction, these can be easily cut where necessary using a drill bit.



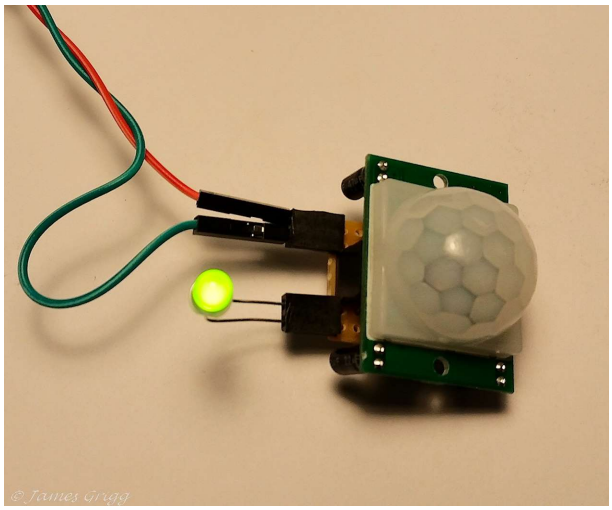


The first step is to decide the layout of parts and how big the board will be. I use a sheet of graph paper that is twice the size of the vero board. This makes it is easy determine the placement and room needed for each part. The part is placed on the actual vero board and the number of holes it covers counted, this is then applied to the graph paper. If you use a pencil and eraser, part placement can be easily changed to suit.
The following is the final layout decided for this circuit.

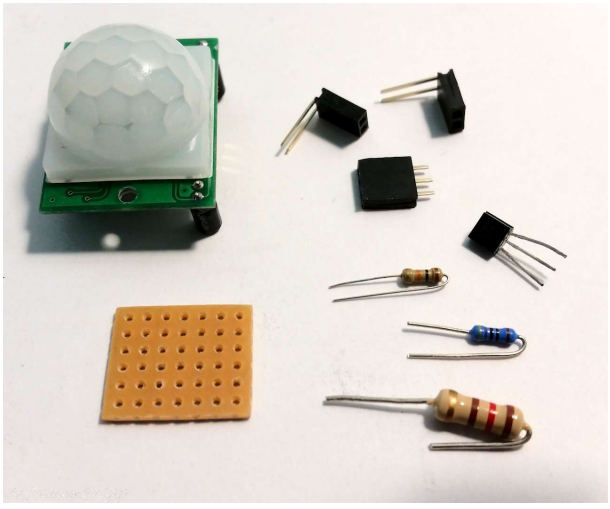


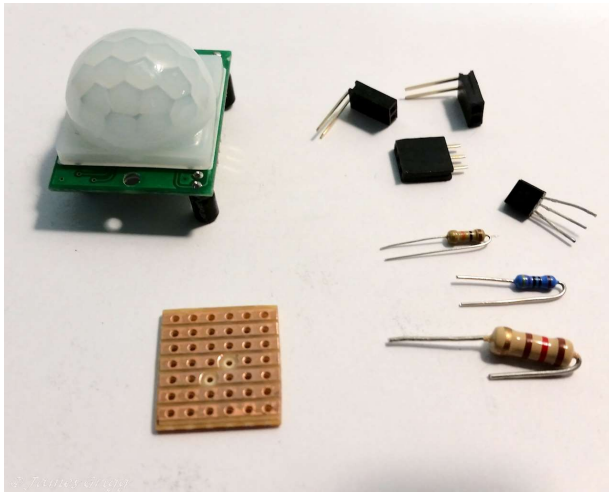
Construction

Finished working circuit.



The following are the parts needed to constuct the circuit. Three extra parts are required, one 3 pin header socket and two 2 pin right angle header sockets. The 3 pin connector will mount vertically and is where the PIR is attached. The 2 pin right angle connectors are for the LED and the battery. The picture shows the small piece of vero board with the two tracks cut.



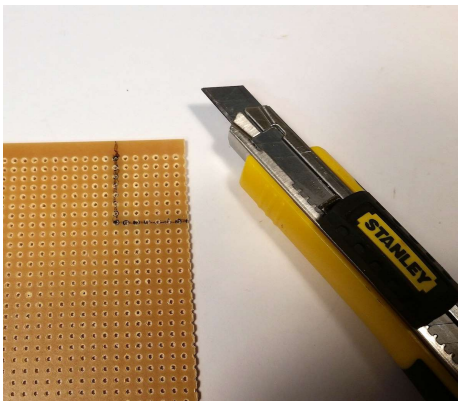


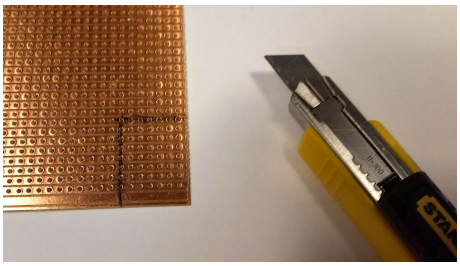
Additional Parts

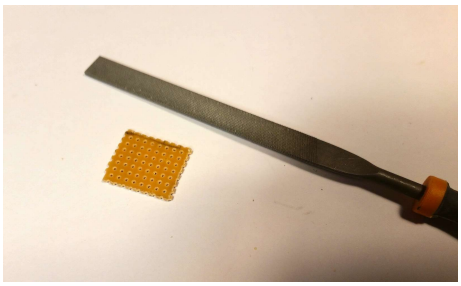
0.100" (2.54 mm) Female Header: 1x3-Pin, Straight SKU: POLOLU-1013 $0.45
0.100" (2.54 mm) Female Header: 1x2-Pin, Right-Angle SKU: POLOLU-2702 $0.40

Steps

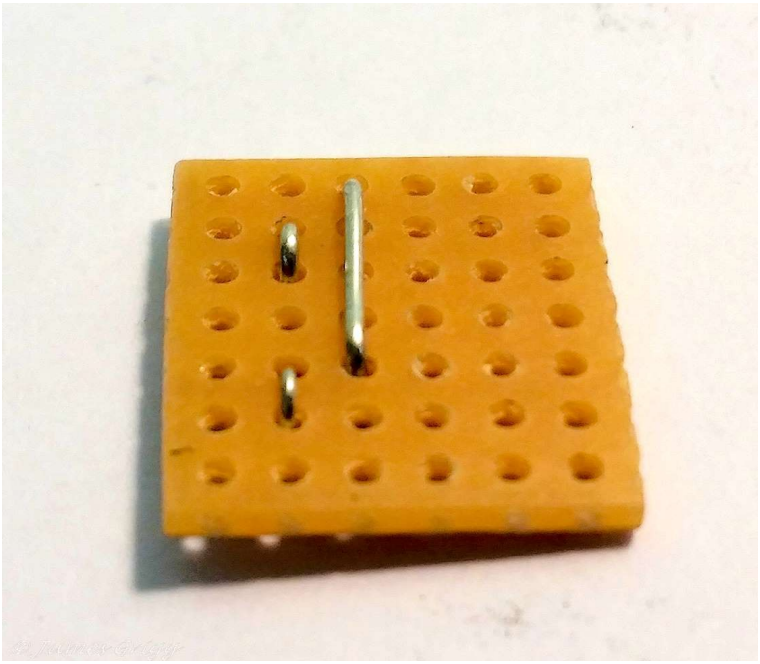
1. Making the vero board.
   Mark the size of the board 1 hole large than what is needed. The required size is 6 x 7, so we mark 7 x 8 as shown. Ensure the orientation is correct, there are 6 hole in each track and 7 tracks.
   Using a hobby knife to carefully score along the marked area. Do this a number of times on both sides of the board.
   Carefully break the board along the scored lines. It might be easier to do this in two stages, vertically, then horizontally. It means you end with more waste of the vero board (but I never throw out a piece as I always find a use for it in the future).
   Using a small file trim the edges of the board till it is neat.
   Use a drill bit to cut the tracks as shown on the graph paper. Remember the graph paper is looking down on the component side of the board. So the cuts have a different orientation when looking down from the track side. See the parts pic above to see both sides of the vero board.



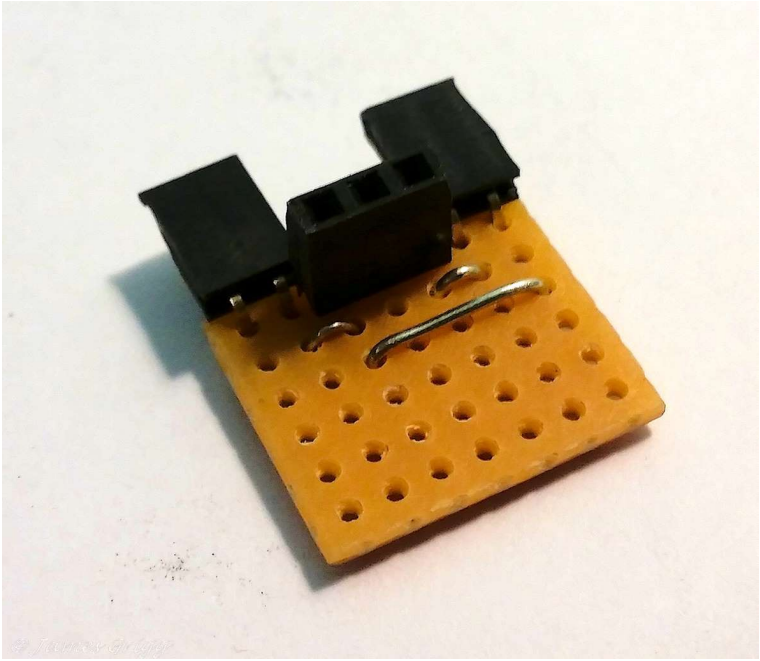




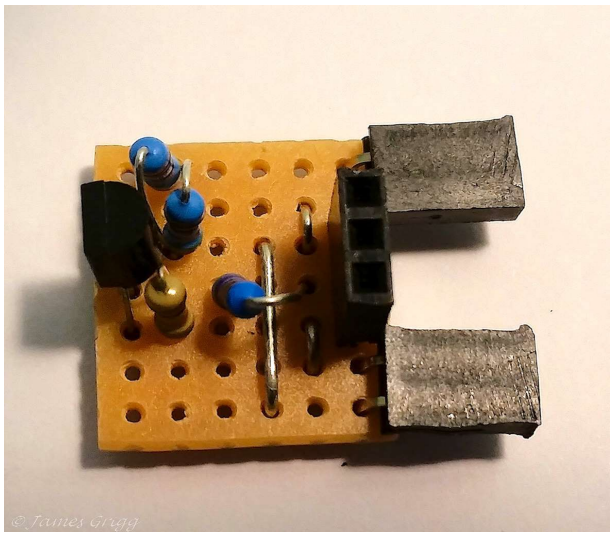
2. Soldering the links to the board.
   These are just small sections of wire. The lenghts cut from the legs of the components can be used for this purpose.

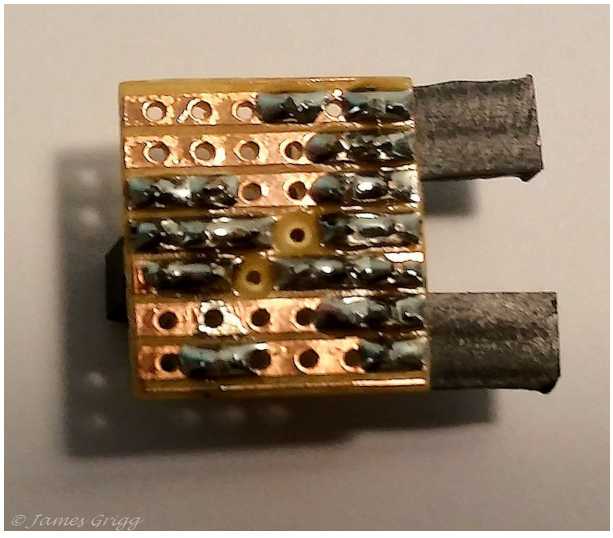


3. Solder the header sockets to the board.

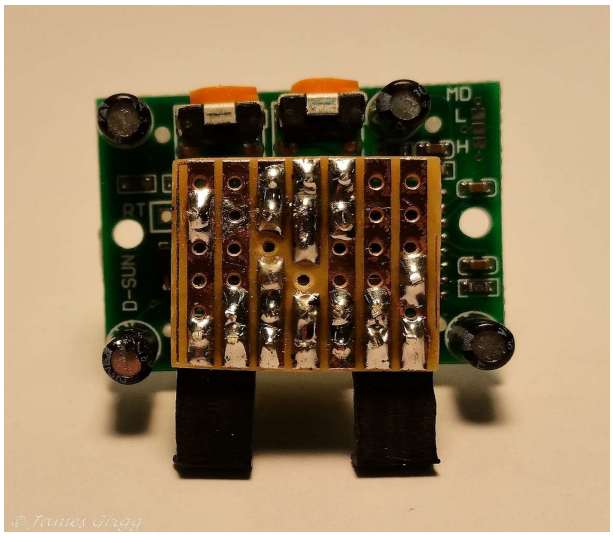


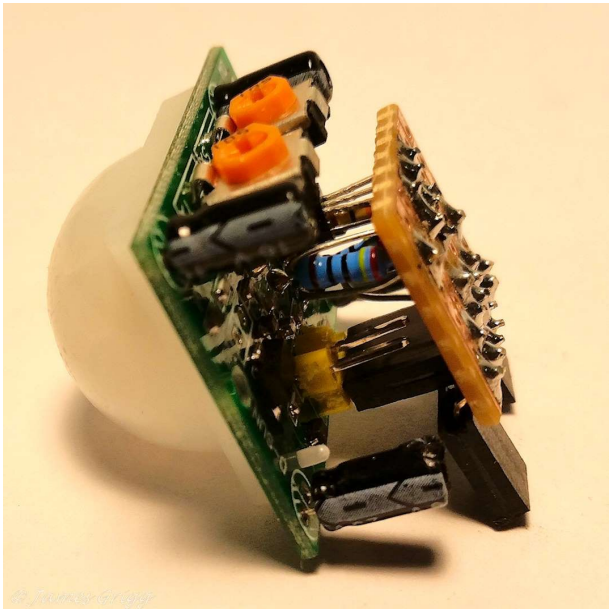
4. Solder the resistors and transistor to the board.
   Ensure the orientation of the transistor is correct, as shown. The curved side is facing out from the board. It will not work if it is placed wrong.
   The picture shows two resistors in place of the 120 ohm, these are 240 ohms. In parrellel the resistance becomes 120 ohms. This was done because the original 120 ohm was to large and my parts bin did not have a smaller 120 ohm.



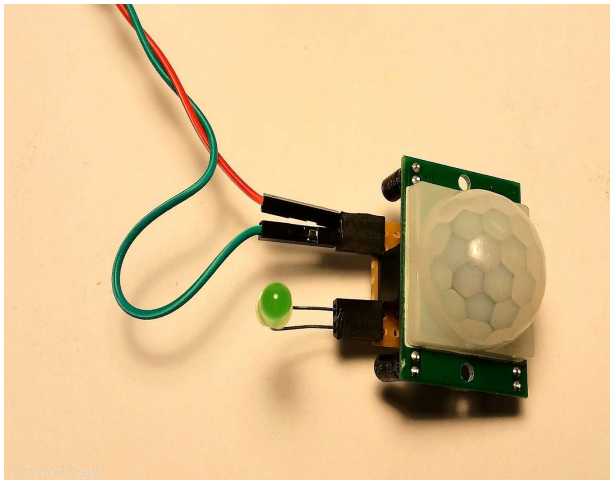


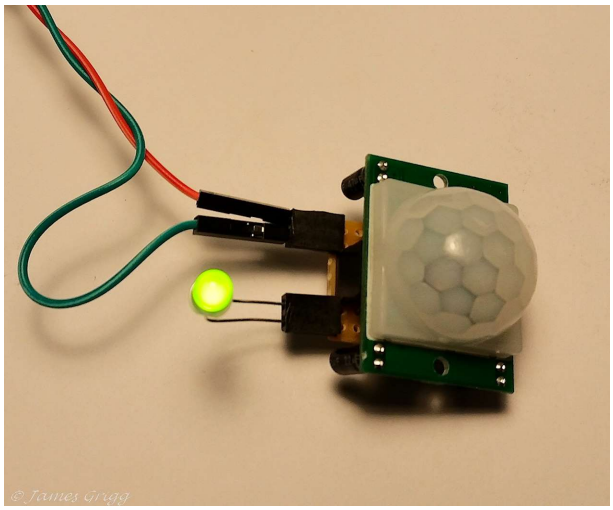
5. Attach the PIR as shown.
   The vero board fits nicely on top of the PIR making it only slightly deeper.





6. Connect the LED & battery, ensure correct orientation. The PIR may be damaged if battery is connected the wrong way around. The LED will not light if it is the wrong way around.





Conclusion

The finished board sits neatly under the PIR; it can move a little, use some hot glue to hold it in place and it will not short out the components on the PIR.
When the light is OFF, the current drain is less than 100uA ensuring long battery life. But ..
When the light is ON, it can drain up to 100mA. The 4 x AA cells would last only a few hours if the light was on all the time.