

Light Dependent Resistor Circuit by VK4ION

Building a Simple Light Dependent circuit using 7 components

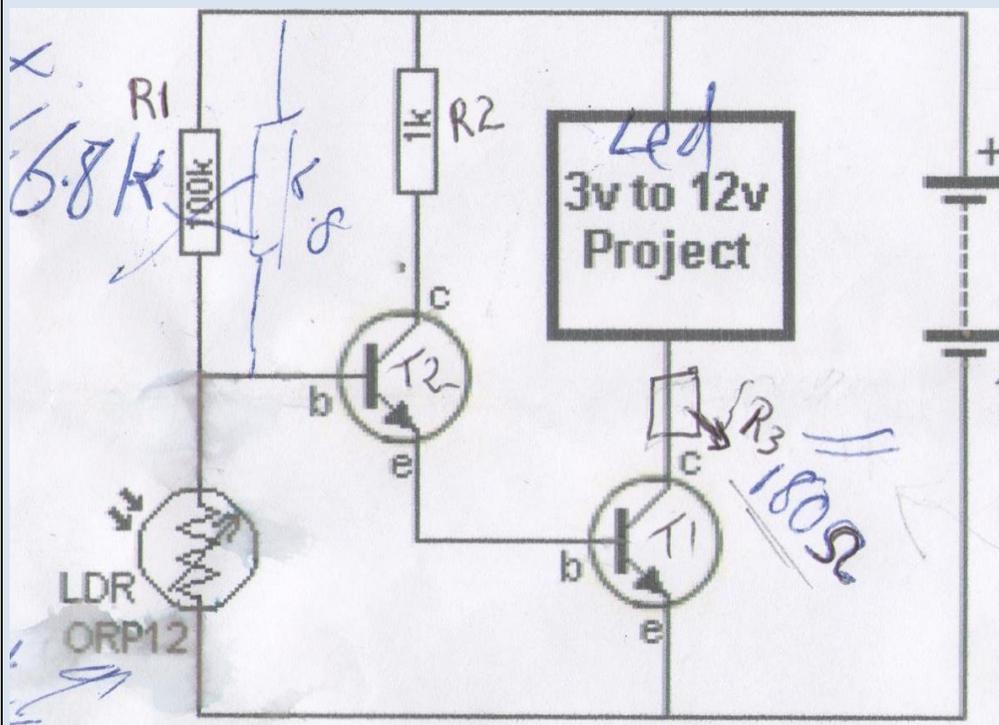
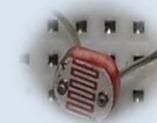


Image 1 - Original circuit with amendments

Amendments allow LED to light with changes to light conditions; total darkness is not required

This circuit detects darkness and allows the LED to turn on

See Image 1 – and note hand written amendments

The original project called for the LDR [Light Dependent Resistor] to function in total darkness. i.e. When it sensed DARK it would 'turn on' the LED.

This posed several problems for me so I amended the circuit and marked my changes on the circuit diagram.

In my circuit the LDR is Off when in ambient light. It turns-ON when it senses a change of light. E.g. passing your hand over the LDR lights the LED.

As a beginner project this gives more satisfaction to the student as they immediately see the results & don't have to wait until dark [and hand waving is such fun].

To achieve this change 2 things were done.

1. Changed the SIZE of the Resistor used between the +ive power rail and the LDR. Substituted 6.8k Ω for the original 100k Ω resistor
2. Fitted a resistor to protect the LED [between the LED & T1]

7 Components required:

- **2 x Transistors 2N2222A** [also labelled T092 or PN2222A]
- **LED – Blue** is more tolerant to current/voltage fluctuations so is more forgiving while playing around and getting the circuit just right
- **LDR – Light Dependent Resistor**
- **Resistor 1: anywhere between 6.8k Ω to 10k Ω** - joins +ive supply rail to LDR
- **Resistor 2: 1k Ω** - joins +ive supply rail and T2 [Transistor 2]
- **Resistor 3: 180 Ω to 330 Ω** - between LED & T1 [Transistor 1]

Note: This project requires 3Volts so use 2 x AA batteries

If using the 'breadboard power supply' See note 1 for tips and warnings.

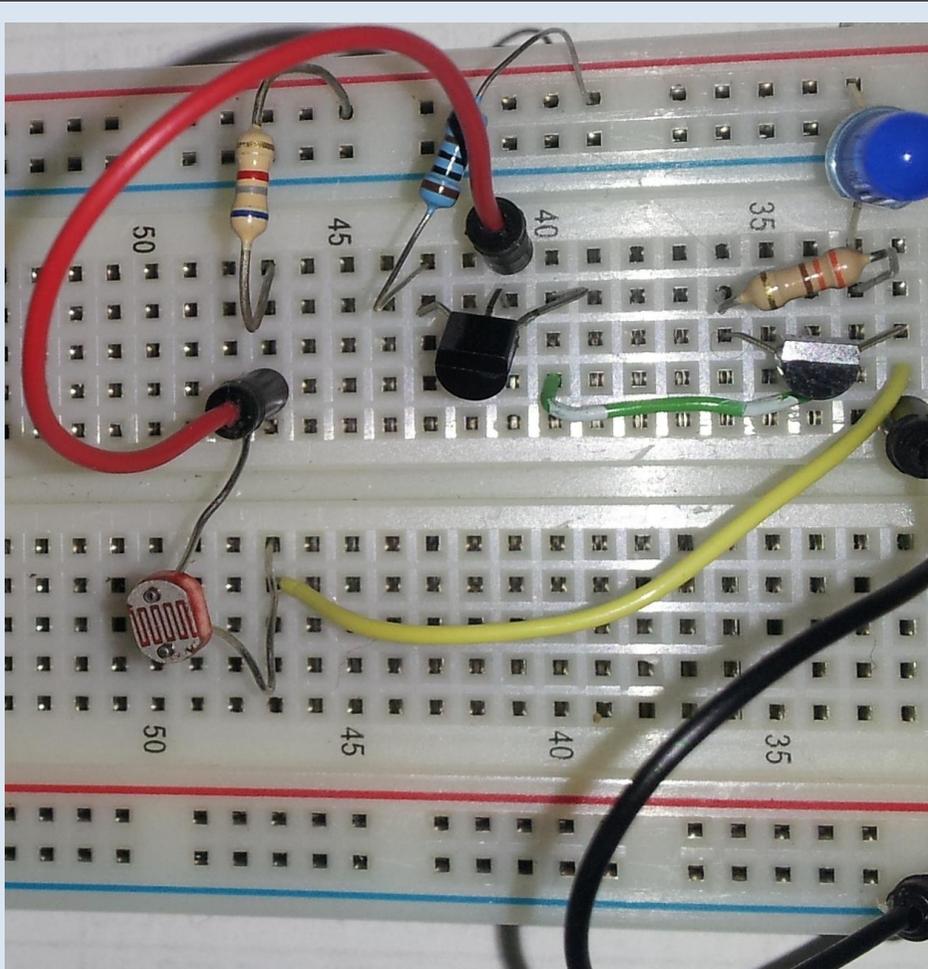


Image 2 working circuit on breadboard

See Images 2 for component layout – showing circuit in the same plane as the schematic. LDR to the Left, LED to the Right

Step 1: Check the schematic – Insert 3 components that have a ‘leg’ the +ive rail

- LED has it's +ive leg [longer leg] in the +ive rail
- R2 - 1k Ω resistor, to the T2 has a leg in the +ive rail
- R1 - 6.8k Ω resistor, to the LDR has a leg in the +ive rail

Step 2: Insert LDR, T2 & R3,

- Insert LDR into cross-row to join R1 – note space to put a jumper later
- Insert T2 – Collector leg in row to join the Resistor R1
- Insert R3 - Resistor to protect the LED - one leg in same cross-row as LED other leg goes to new cross-row

Step 3: Insert T1

- Insert T1 – Collector leg in row to join the Resistor R3
- Base & Emitter to unused cross-rows

All 7 components are now in the circuit – time to add jumper leads to connect the circuit

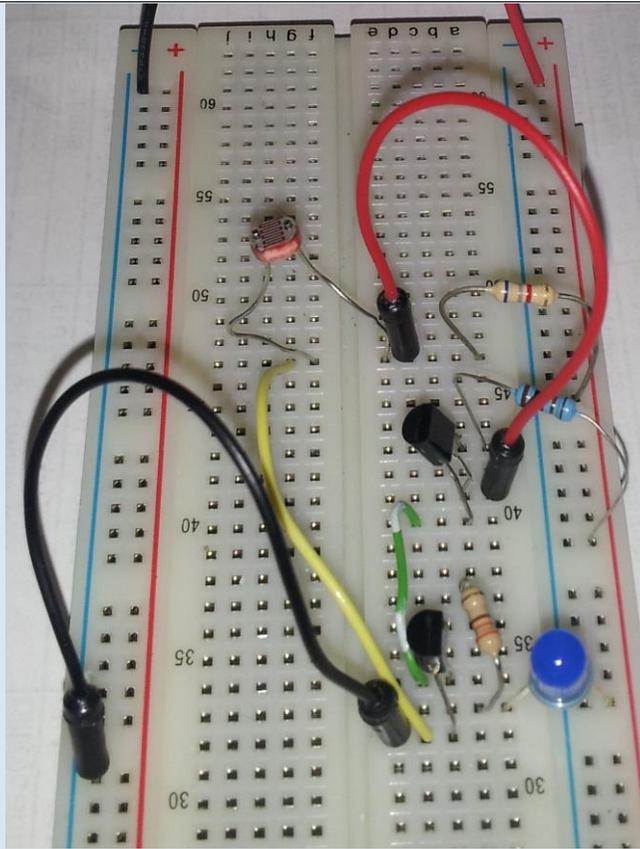


Image 3

Step 4: Insert jumper leads to connect the components

See image 3 coloured Jumpers – J1 Yellow; J2 Green/white; J3 Red; J4 Black

J1 – yellow - joins LDR to the EMITTER of T1 in series

J2 – green/white - joins EMITTER of T2 to BASE of T1

J3 – red – one leg goes in space between the LDR & it's Resistor R1
Other leg goes to BASE of T2

Finally the circuit must go to the NEGATIVE rail

Insert J4 – black

One leg in -ive rail – other end to cross-row T1 EMITTER
[that cross-row has 3 pins when complete]

Check the circuit – is there an unbroken 'loop' of power around the board?

Components have both ends connected – to another component or jumper?

Time to put the 3volts of power into the breadboard

The LED may flash at first but it should NOT remain lit.

Pass your hand over the Light Dependent Resistor and the LED will glow
As daylight disappears the LED begins to glow more brightly.

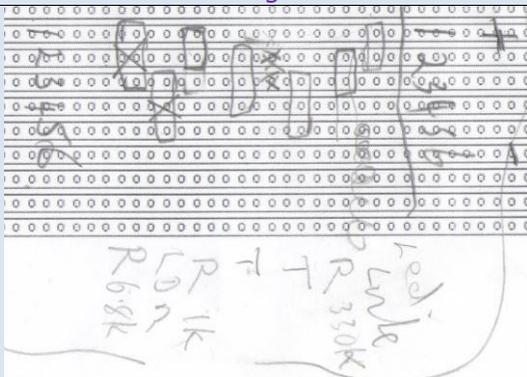


Image 5

Here are 2 examples – Images 4 & 5 – they are not complete

Don't follow these drawings. They are only rough examples of how

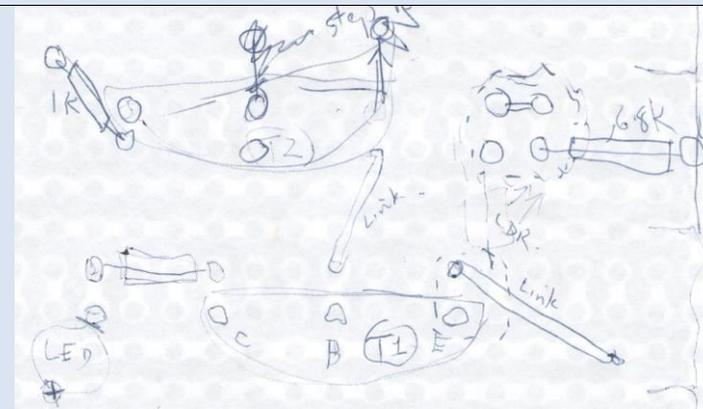


Image 4

Step 5: Draw the circuit onto a veroboard template

- What you draw will depend on the type of Vero Board you have.

to begin working with veroboard

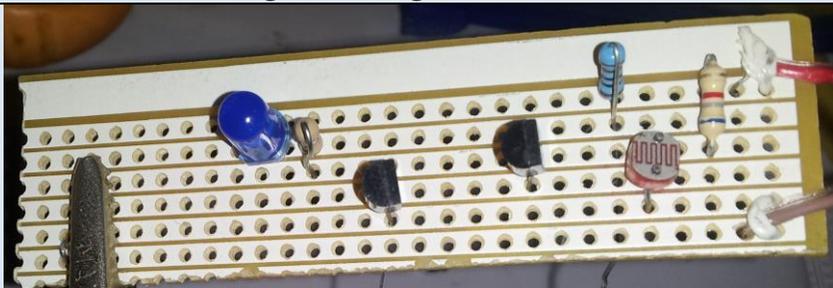


Image 6

- Draw on paper what **you** are going to build

Step 6: Build on a veroboard

- First attempt –
- I wasn't happy, my soldering iron was quite large for such small and close soldering on the back

It was a mess so I started again

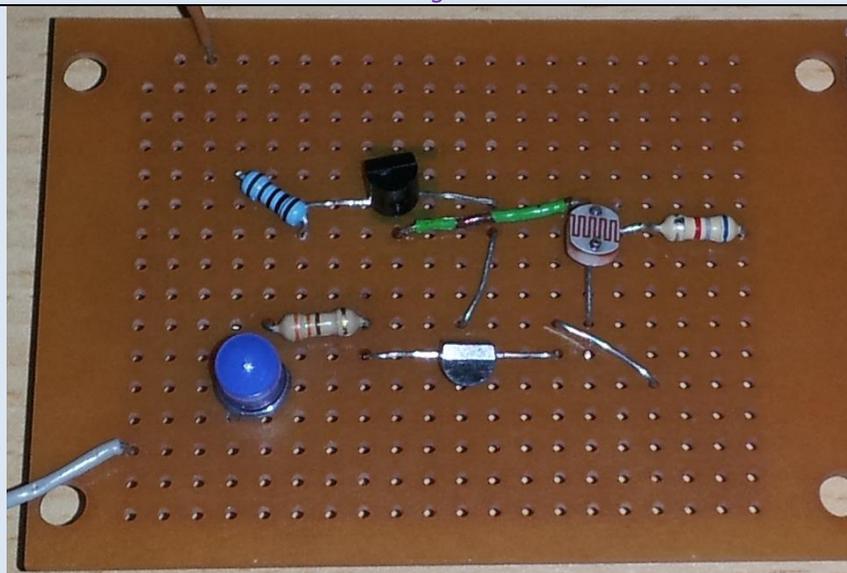


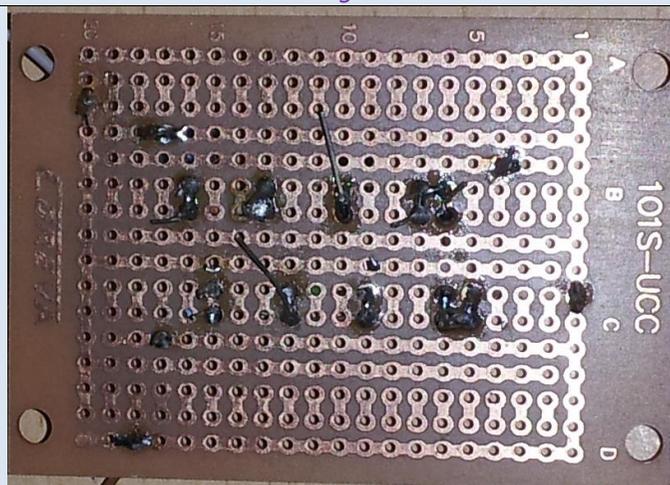
Image 7

Step 7: Success!

- The circuit works
- I had more room to spread out
- Yes... there are several 'links' in this project that aren't in *Image 6* above but at least I could spread out my components and solder in clearly defined areas.

I don't doubt that if I practiced I could get better, get components closer together and do away with these links but for now I am very happy with my project.

And I wave my hand over it all the time here on my desk!



The reverse of the board

It won't help you build the circuit but it's just an example of the board I could buy and how I made it work for this circuit

Image 8

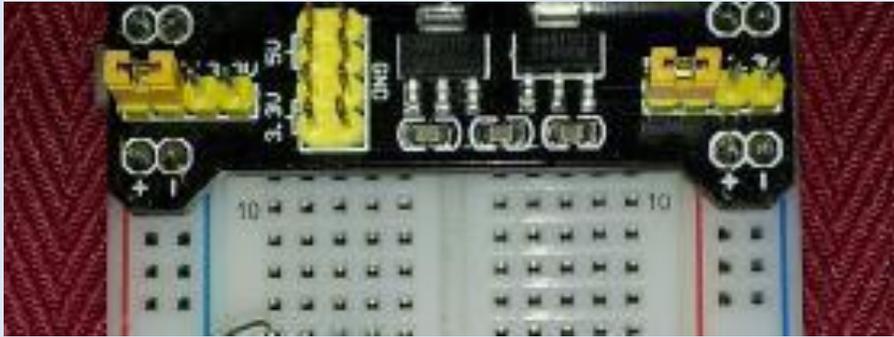


Image 9 – power supply on breadboard

Note the 'darker yellow' moveable plastic fitting

In this image the fitting is sitting over the 5v output power pins which corresponds with the +/- rails below

The left side set of power rails are independent from the right side power rails

When the 9V battery is connected both left and right "set of rails" are made 'live' and have the voltage according to which set of pins YOU joined with the dark yell plastic fitting

If using a 9V battery use the Power Supply provided with the breadboard

The power supply and plug with 9v battery cap were in the first workshop kit

For this project you need to adjust the Power Supply so that it only puts 3.3volts into the breadboard.

Note: Power Supply - Image 9 - has 2 possible outputs marked with 5V & 3.3V

It has left and right side outputs – which are independent of each other but 'match' for red/blue rails on the breadboard. You could have 2 different projects on the board – one using 5 volts from one side and the other using 3.3 volts.

To set this power supply to 3.3 volts you move the small darker yellow plastic fitting over the set of pins you want to select – for this circuit the 3.3V output

Don't put 5V into this circuit.

Past workshop circuits a 9V battery was directly connected to the board by using +ive on one side of the board & -ive on the other side. This allowed attendees to spread out their work on the board and keep the red/black battery leads well away from each other.

IF you use this power supply the previous images will need to be adjusted as they show positive and negative power coming directly from a 3V battery pack and +ive & -ive rails on opposite sides of the breadboard.