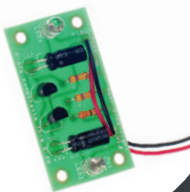


Kitronik

MASTER THE ART OF SOLDERING WITH THIS

# REAR BIKE LIGHT KIT



# BUILD INSTRUCTIONS

Before you start take a look at the Printed Circuit Board (PCB). The components go in the side with the writing on and the solder goes on the side with the tracks and silver pads.

## 1 PLACE RESISTORS

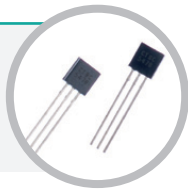
Start with the three resistors. The text on the PCB shows where R1, R2 etc go. Make sure that you put the resistors in the right place.

PCB Ref	Value	Colour Bands
R1&R2	470K	Yellow, purple, yellow
R3	33 $\Omega$	Orange, orange, black



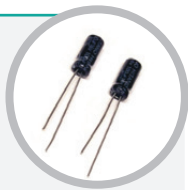
## 2 PLACE THE TRANSISTORS

Place the two transistors into the board where it is labelled Q1 and Q2. Make sure the device is the correct way around. The shape of the device should match the outline on the PCB.



## 3 PLACE THE CAPACITORS

Place the two capacitors into the board where it is labelled C1 and C2. Make sure the device is the correct way around. The capacitors have a '-' sign marked on them which should match the same sign on the PCB. Once the legs have been pushed through the board the capacitor should be folded flat against the PCB before it is soldered into place.



4

## SOLDER THE LEDs

Place the two Light Emitting Diodes (LEDs) into LED1 and LED2. It does not matter which goes where, but the light won't work if they don't go in the right way around. If you look carefully one side of the LED has a flat edge, which must line up with the flat edge on the lines on the PCB. You may want to solder them in at a specific height depending upon how you have designed your enclosure (if you are making one). Once you are happy solder them into place.

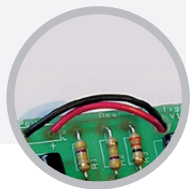


5

## FIT THE BATTERY HOLDER

Finally you must attach the battery holder. Start by feeding the leads through the strain relief hole near R3. The wire should be fed in from the rear of the board (see lower image).

The red lead should be soldered to the '+' terminal (also marked with the text 'red') and the black lead should be soldered to the '-' terminal (also marked with the text 'black').

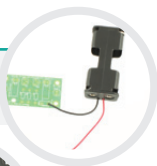


## ADDING AN ON/OFF SWITCH

If you wish to add a power switch, don't solder both ends of the battery cage directly into the board, instead:

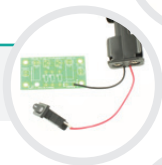
1

Solder one end of the battery cage to the PCB, either black to '-' or red to '+'.



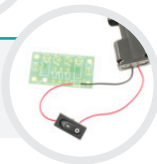
2

Solder the other end of the battery cage to the on / off switch.



3

Using a piece of wire, solder the remaining terminal on the on / off switch to the remaining power connection on the PCB.

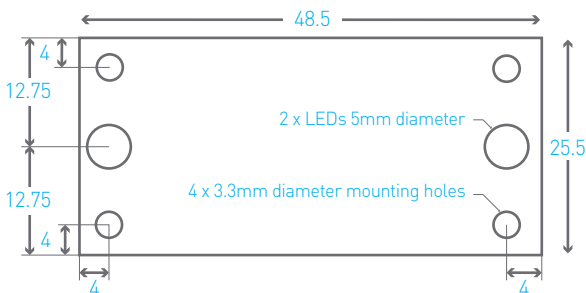


## CHECKING YOUR BIKE LIGHT PCB

Carefully check the following before you insert the batteries:

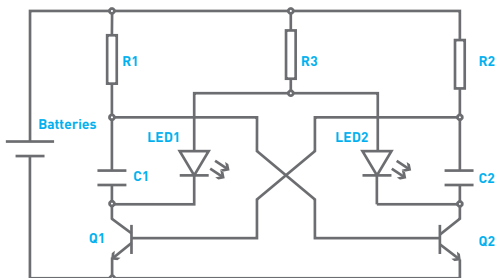
- Check the bottom of the board to ensure that:
  - All holes (except the 4 large (3 mm) holes in the corners) are filled with the lead of a component.
  - All these leads are soldered.
  - Pins next to each other are not soldered together.
- Check the top of the board to ensure that:
  - The shape of the transistors match the outline on the PCB.
  - The flat edge of each of the LEDs matches the outline on the PCB.
  - The '-' on the capacitors match the same marks on the PCB.
  - The colour bands on R3 are orange, orange and black.
  - The battery cage red and black wires match the red & black text on the PCB.

## MECHANICAL DETAILS

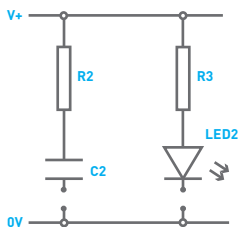
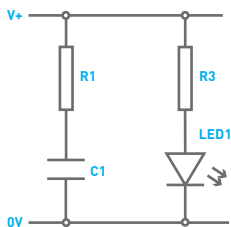


Dimensions in mm

# HOW THE BIKE LIGHT WORKS



The circuit has two states which it alternates between. In each of the states one of the LEDs is on while the other is off.



## State 1 (see picture above):

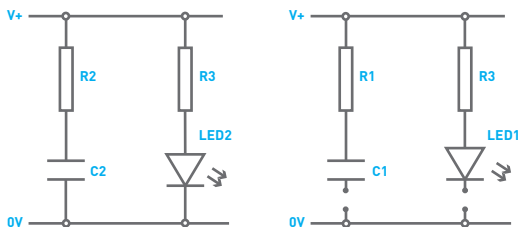
Q1 is turned on which connects LED1 and C1 to 0V. This turns LED1 on and C1 starts to charge through the resistor R1 causing the voltage across it to increase (it starts at less than 0.7V). The voltage at the base of Q2 starts to rise as C1 charges as they are both connected to each other.

As C1 has less than 0.7V across it Q2

is turned off. This means LED2 is not connected to 0V and is therefore turned off. C2 (which has more than 0.7V across it) is gradually discharging into the base of Q1.

This continues until the C1 has sufficient charge to produce a voltage  $>0.7V$  on the base of Q2, which causes it to turn on.

## HOW THE BIKE LIGHT WORKS



### State 2 (see picture above):

Q2 is now turned on which connects LED2 and C2 to 0V. This turns LED2 on. This connection of C2 to 0V causes the voltage across it to drop below 0.7V turning off Q1. Now C2 starts to charge through the resistor R2 causing the voltage across it to increase. The voltage at the base of Q1 starts to rise as C2 charges as

they are both connected to each other.

As C2 has less than 0.7V across it Q1 is turned off. This means LED1 is not connected to 0V and is therefore turned off. C1 (which has more than 0.7V across it) is gradually discharging into the base of Q2.

The right hand side of the circuit is in the same state that the left hand side started in Stage 1, but with C2 charging instead of C1. When the charge gets high enough the circuit flips back to Stage 1.

R3 is needed to limit the amount of current flowing through the LED. The transistors aren't turned fully on so also contribute to the limiting of current flowing through the LED. This means the current limit resistor is smaller than it would otherwise be.



This easy build bike light kit has just ten parts, making it a good introduction to electronics. The kit uses two ultra bright red LEDs, which flash rapidly, providing a highly visible light. Making it ideal for use as a rear bike light.

Note: We recommend this rear bike light is used in conjunction with a commercially available light.



Example Use



#### TOOLS REQUIRED:

- Soldering Iron
- Solder
- Wire Cutters



#### INSTRUCTIONS:

This booklet contains build instructions and a circuit explanation. For more detailed resources please visit our website at [www.kitronik.co.uk/2106](http://www.kitronik.co.uk/2106)



#### KIT REQUIRES

2 x AA batteries



#### STOCK CODE

2106 or 1006 (Retail Version)



**WARNING:** Contents may inspire creativity

T: 0845 8380781

W: [www.kitronik.co.uk](http://www.kitronik.co.uk)

E: [support@kitronik.co.uk](mailto:support@kitronik.co.uk)

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For more information on RoHS and CE please visit [kitronik.co.uk/rohs-ce](http://kitronik.co.uk/rohs-ce). Children assembling this product should be supervised by a competent adult. The product contains small parts so should be kept out of reach of children under 3 years old.