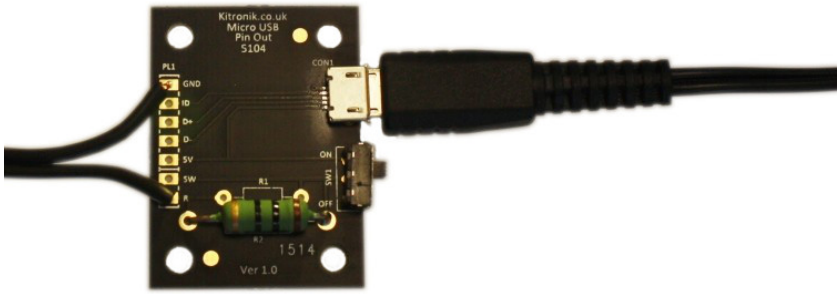
Kitronik

ESSENTIAL INFORMATION

BUILD INSTRUCTIONS
CHECKING YOUR PCB & FAULT-FINDING
MECHANICAL DETAILS
HOW THE KIT WORKS

DESIGN A STYLISH LAMP WITH THIS

Micro USB Lamp Kit



Version 2.1

Micro USB Lamp Essentials

www.kitronik.co.uk/2152

Build Instructions

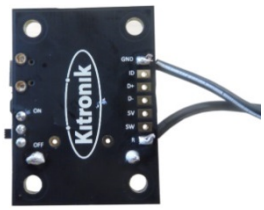
Before you start, take a look at the Printed Circuit Board (PCB). The components go in the side with the writing on and the solder goes on the side with the tracks and silver pads.

1 PLACE THE RESISTOR

Bend the legs of the resistor and put them through the holes marked R2 on the PCB. Then bend them flat to hold the resistor in place. Turn the PCB over and solder the joints on the resistor. Trim the legs off when you are happy with the joints. It does not matter which way around the resistor goes.

2 SOLDER THE WIRES TO THE PCB

Strip one end of the wire supplied. Solder the wire with the white stripe into the PCB pad labelled 'GND'. Solder the plain black wire to the pad labelled 'R'.



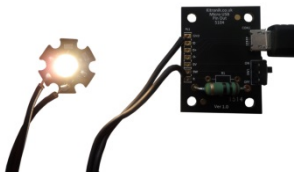
3 SOLDER THE WIRES TO THE LED

Solder the wire with the white stripe to one of the negative pads on the LED, it doesn't matter which one. The negative pads are indicated with a '-' symbol. Solder the plain black wire to one of the positive pads, the positive pads are indicated with a '+' symbol.

4 PLUG IN THE POWER

Plug a 5V Micro USB power supply (such as a mobile phone charger) into the connector then slide the switch to the on position, labelled on the PCB.

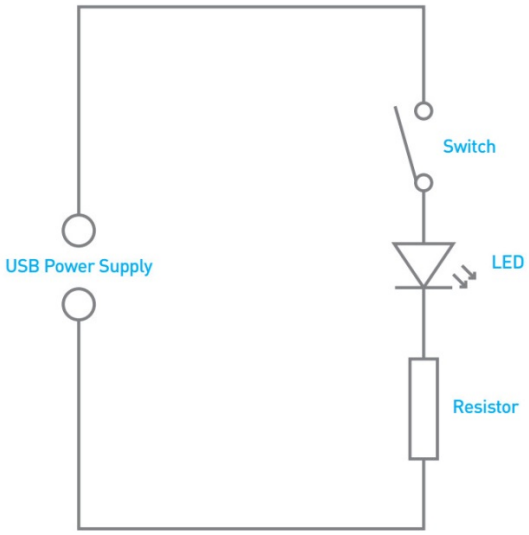
Note: The LED and resistor will get quite warm to the touch, so avoid handling if it is on or has recently been on for a long time.



Checking Your Micro USB Lamp PCB

- Is the positive '+' pad on the LED wired to the terminal labelled 'R' on the PCB?
- Is the negative '-' pad on the LED wired to the terminal labelled 'GND' on the PCB?
- Have you soldered the resistor into the position marked R2 on the PCB?

How the Micro USB Lamp Works

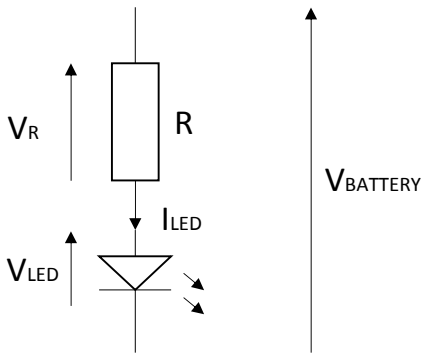


The circuit diagram for the USB lamp is shown above. It is a very simple circuit. The 5V that powers the circuit is supplied from the micro USB connector.

LEDs can be damaged if the current through them is not limited. Like diodes, LEDs drop some voltage across them: typically 1.8 volts for a standard LED. However the high brightness LED used in the lamp drops 3.2 volts. The USB lamp runs off the 5V supply provided by the USB connection so there must be a total of 5 volts dropped across the LED (V_{LED}) and the resistor (V_R). As the LED manufacturer's datasheet tells us that there is 3.2 volts dropped across the LED, there must be 1.8 volts dropped across the resistor. ($V_{LED} + V_R = 3.2 + 1.8 = 5V$).

Using: Power = V_{LED} x I_{LED}
1W = 3.2V x I_{LED}

Therefore I_{LED} = 1W / 3.2V
I_{LED} = 0.313A = 313mA



Since we know that the voltage across the current limit resistor is 1.8 volts and we know that the current flowing through it is 0.313 Amps, the resistor can be calculated.

Using Ohms Law in a slightly rearranged format:

$$R = \frac{V}{I} = \frac{1.8}{0.313} = 5.75\Omega$$

Hence we need a 5.75Ω current limit resistor. The nearest available 'power' resistor is 10Ω so this has been used (but will make the LED a fraction dimmer).

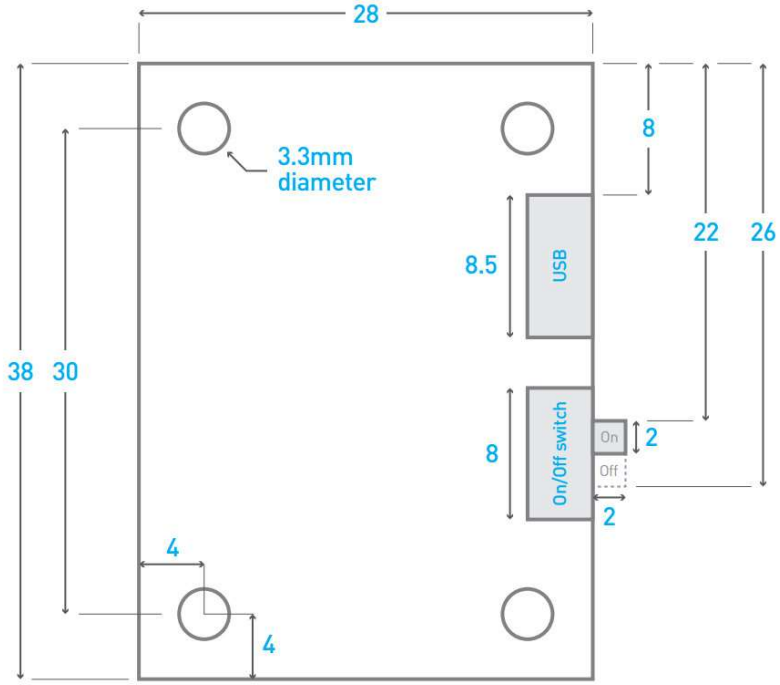
Finally, the on / off switch allows the circuit to be opened and closed: open the switch to turn the LED off and close the switch to turn the LED on.

Designing the Enclosure

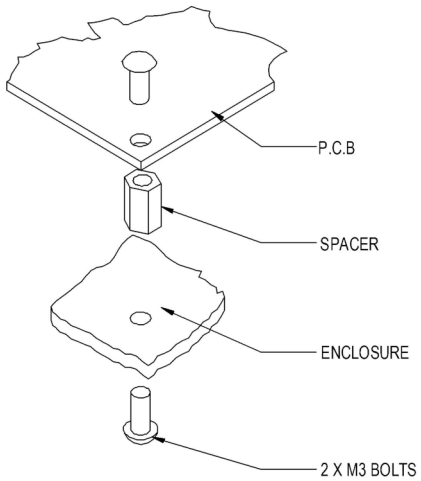
When you design the enclosure, you will need to consider:

- The size of the PCB (below).
- Where the on / off switch is mounted.
- There are four 3.3mm holes in the corners of the PCB to secure the PCB in the enclosure.

This technical drawing of the built Micro USB Lamp PCB should help you to design your enclosure.



(Dimensions in mm)



Mounting the PCB to the enclosure

The drawing to the left shows how a hex spacer can be used with two bolts to fix the PCB to the enclosure.

Your PCB has four mounting holes designed to take M3 bolts.

Online Information

Two sets of information can be downloaded from the product page where the kit can also be reordered from. The 'Essential Information' contains all of the information that you need to get started with the kit and the 'Teaching Resources' contains more information on soldering, components used in the kit, educational schemes of work and so on and also includes the essentials. Download from:

www.kitronik.co.uk/2152

This kit is designed and manufactured in the UK by Kitronik

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