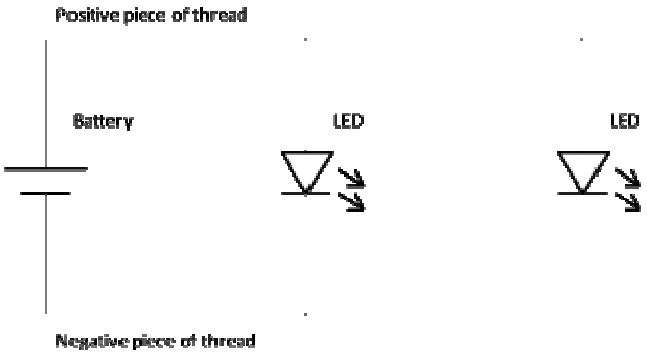
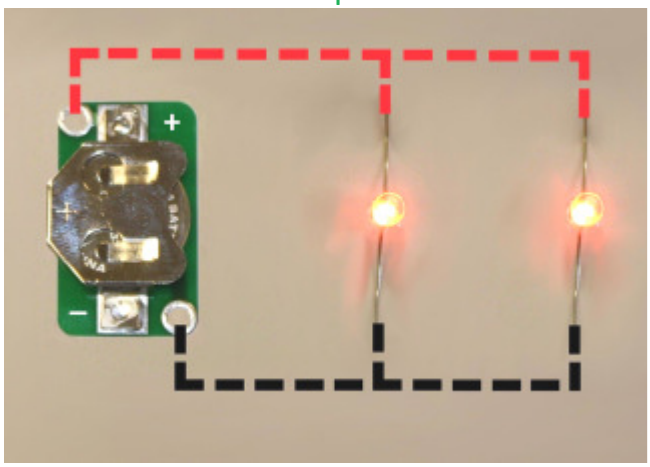
Kitronik Ltd – How to make a basic e-textile LED circuit

Build instructions

Circuit diagram

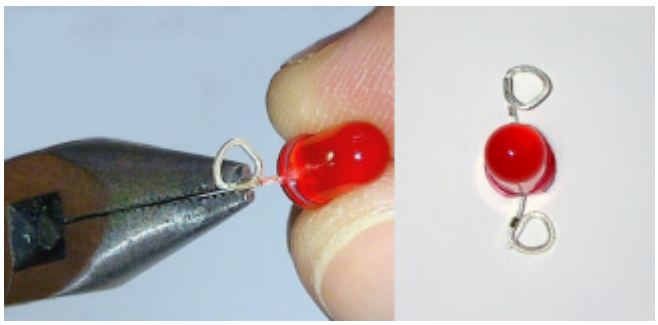


Stitched equivalent



The basic sewable LED circuit is very simple and created by placing the LEDs in parallel with the battery. This is shown in the circuit diagram above left.

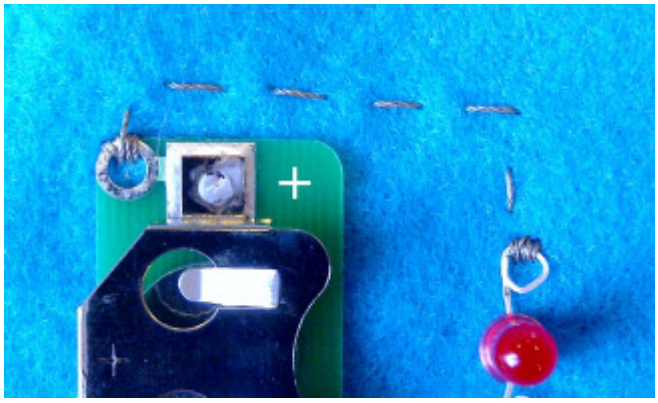
To recreate this circuit, two pieces of conductive thread are used. One is used to connect the positive connection on the battery holder, to the positive leg on each LED used. The second piece of thread is used to connect the negative connection on the battery holder, to the negative leg on each LED used. The positive and negative pieces of thread must not touch each other.



Forming the LED legs into 'eyelets'

To make the LEDs easier to stitch into position the legs can be formed into 'eyelets'. This can be achieved easily by forming the legs of the LED with a pair of long nose pliers.

The reason for creating the 'eyelets' is to ensure the thread can be securely attached the LED, without the possibility of it being easily dislodged.



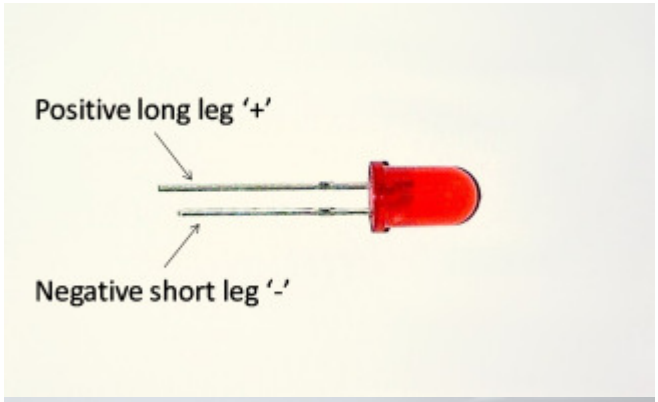
Stitched connections

It is important to create tight and secure connections at the point where the thread attaches to the battery holder and LEDs. The thread must be attached tightly to these items, so that a good electrical connection is established.

Each joint should be stitched through a number of times, each time it should be pulled tight, to ensure this is the case.

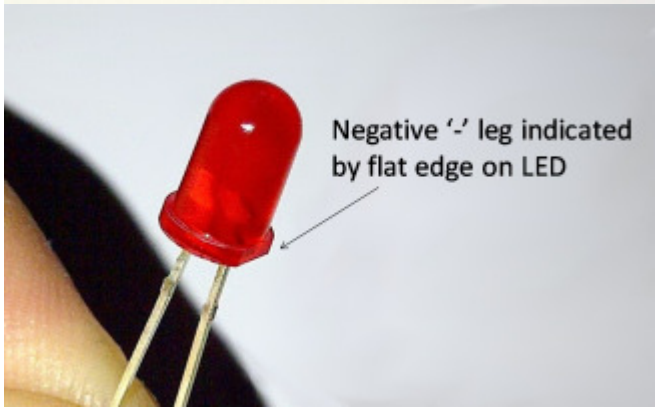
LEDs – identifying the positive leg

The LEDs that are used in the kit will only work if they are connected the correct way around. It is very easy to determine the positive leg (anode) and negative leg (cathode).



Leg length

The easiest way to identify the positive and negative leg is by the length of the legs (see diagram left). The long leg is the positive '+' and the short leg is the negative '-'.



Flat edge

The other way of identifying the negative '-' leg is by the flat edge on the LED (see diagram left). This can be very useful if you have formed your leg into eyelets.

Why don't I need a current limit resistor?

For an LED to light properly the amount of current that flows through it needs to be controlled. To do this a current limit resistor is normally used. A resistor is a device that opposes the flow of electrical current. The bigger the value of a resistor the more it opposes the current flow. The value of a resistor is given in Ω (ohms) and is often referred to as its 'resistance'.

Normally if we didn't use a current limit resistor the LED would be very bright for a short amount of time, before being permanently destroyed. It is not necessary to use a current limit resistor in the sewable LED kits for three reasons.

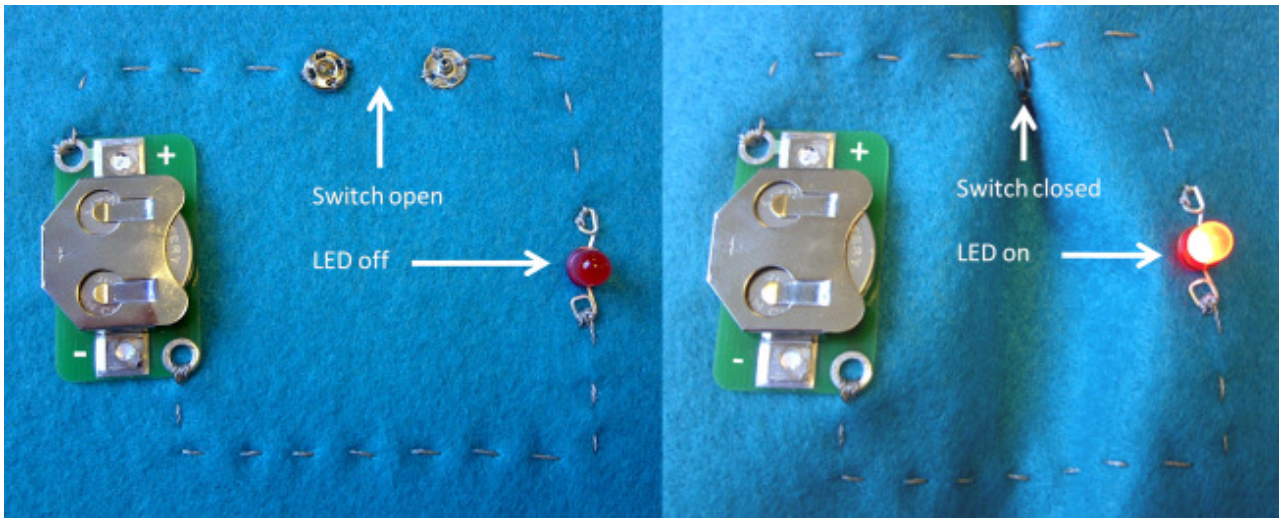
1. The types of LEDs used have the resistor built in to them.
2. The conductive thread has a slight resistance.
3. The coin cell has some internal resistance, which means the power it can deliver is limited.

Adding a switch to the circuit

There will be many ingenious ways in which a switch can be added / created in a conductive thread circuit. One of the most common methods is shown below.

Press stud switch

This is an easy way to add a textiles 'switch' into your circuit. Instead of the positive thread being sewn directly to the LED, a metal press stud is sewn in series as shown below. When the press stud is open the circuit is broken and no electricity can flow to the LED, which will therefore be off. When the press stud is closed the circuit is completed and he LED will be on.



How many LEDs can I use?

We have successfully run up to five colour changing or flashing LEDs from a single (new) coin cell. You may be able to run more, but it very much depends of the lengths of conductive thread and type of LEDs used.

Please note that when multiple colour changing or flashing LEDs are used, the LEDs will not cycle / flash in time with each other.

How long will the batteries last?

A typical LED uses about 20mA and the capacity of a lithium coin cell is 200mA. Therefore the table below will give a battery life estimate for between one and five LEDS.

Number of LEDs	Battery life
1	10 hours
2	5 hours
3	3.3 hours
4	2.5 hours
5	2 hours

What other LEDs can be used?

As the coin cell provides 3V any LED with a supply or forward voltage of between 3V and 5V will generally be OK.

LEDs that meet this requirement are, colour changing, flashing, 5V and most white and blue LEDs.

A PDF showing the specification of all of our LEDs can be seen at: www.kitronik.co.uk/pdf/leds.pdf