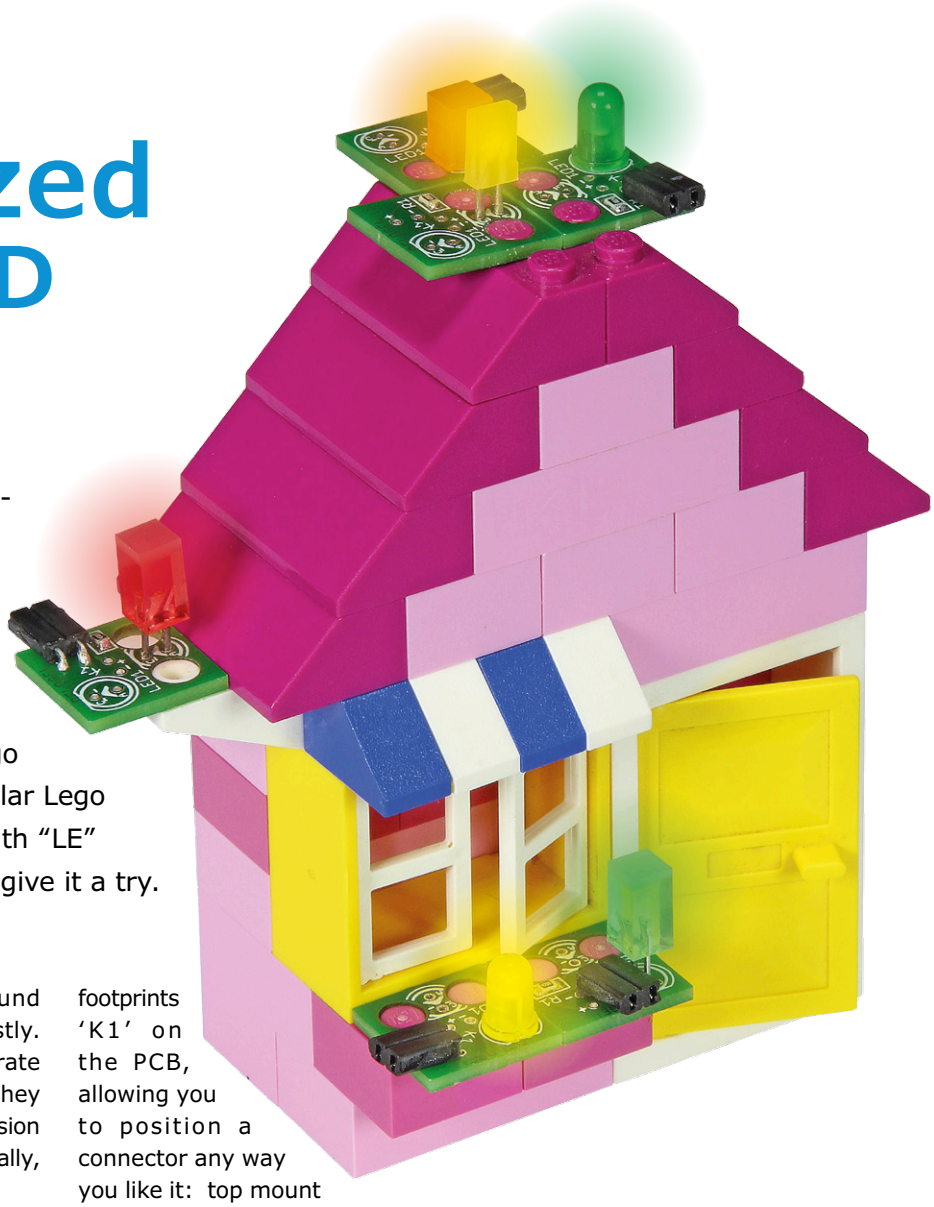
Elektorized Lego™ LED

By **Clemens Valens** (Elektor.Labs)



Lego™ has never been more popular, it was even elected 2015's World's Most Powerful Brand. Though not a brand, LEDs (light emitting diodes) enjoy similar popularity. It made us wonder what happens when you cross Lego with LEDs? The World's Most Popular Lego brick? (is everything that starts with "LE" highly successful?) We decided to give it a try.

Lego compatible LEDs have been around for a number of years, but they are costly. Admittedly, those dedicated LEDs integrate better with Lego than our little PCB, but they are hard to customize. The elektorized version by contrast is adaptability itself, electronically, see the humble schematic in **Figure 1.**
After some experiments we found that to be versatile a Lego-compatible LED must have options. Some people want to put the LED inside a construction (like a light inside a house), others want it on the outside (like a street light). Our PCB shown in **Figure 2** can do both, thanks to two LED footprints. Big LEDs or small, you can even fit SMD types if you like. Respect the polarity though, otherwise the '+' and '–' symbols on the PCB will be wrong. Do not fit two LEDs on the board.

It's up to you how to connect or wire the LED module to a supply or a controller system. We've a preference for a 90-degree 2-way pinheader socket, but in which direction? To get out of this pickle we put two connector footprints 'K1' on the PCB, allowing you to position a connector any way you like it: top mount or bottom, horizontal or vertical, North, South, East, West — whatever you like.
To prevent it flashing intensely, just once, an LED needs a current limiting resistor. The footprint for it is on the PCB, of course,

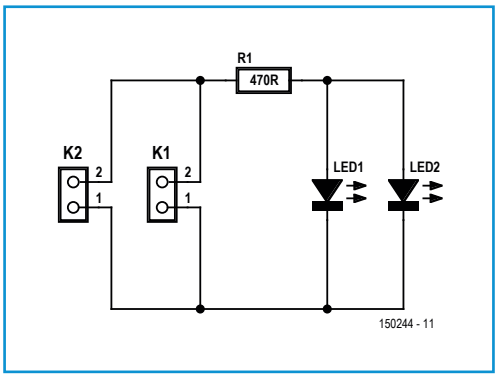


Figure 1.
Although the schematic indicates two LEDs in parallel, only one should be fitted. The parts labeled LED1, LED2 actually represent different LED footprints on the circuit board.

Lego is a trademark of the Lego Group.

together with the LED. There is not a lot of room, so it's an SMD resistor in an 0805 package. Its default value is 470 ohms, but the actual value of course depends on the supply voltage, the color of the LED and the brightness required. If you are going to experiment a lot then you may opt to put the resistor somewhere else and connect it as an external part.

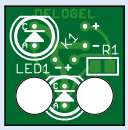
Interesting fact: the thickness of standard 1.6-mm FR4 PCB material with varnished copper on both sides equals the height of a Lego brick knob. ⏮

(150244)

Component List

Resistors
R1 = 470Ω, SMD 0805, 5%, 0.1W (see text)

Semiconductor
LED1 = LED, 7.8x7.8mm (see text)



Miscellaneous
K1 = 2-way pinheader socket, 90 degrees angled, 0.1" pitch
PCB # 150244-1 v1.1 from Elektor Store
Module 150244-71 Build Upons LED (lego compatible) LunchboxElectronics.com

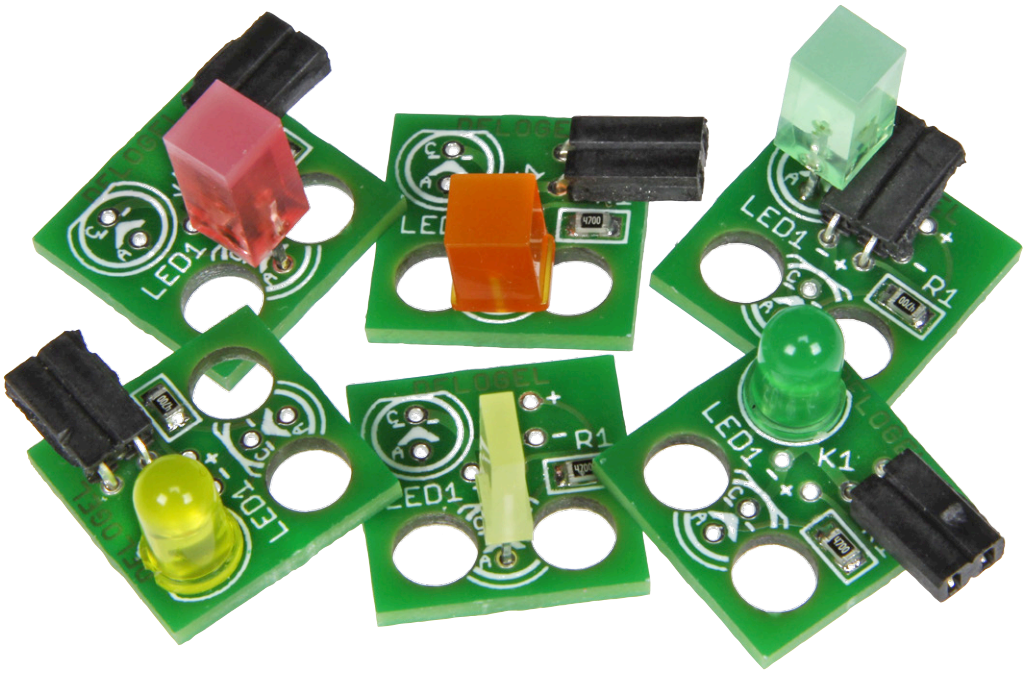


Figure 2.
The carefully designed PCB for the Lego LED. Note the two LED footprints and the different positions available for the LED connector. Select the one that fits your application best.