Piggyaxe 6-LED Random Flasher Kit

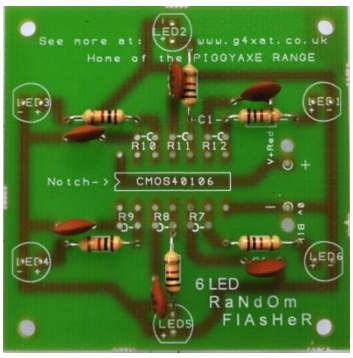
Electronics is FUN – so let's build a 6-LED RaNdOm FlAsHeR!

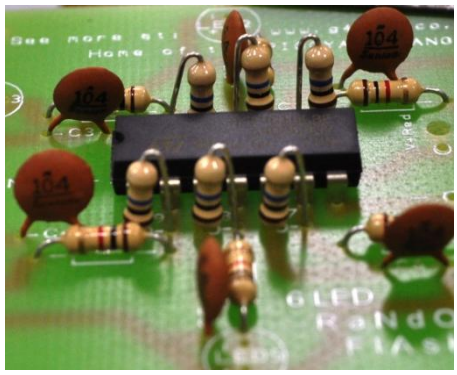
Start by collecting the following parts (Available as a Rapid Electronics kit, order code 70-1053):

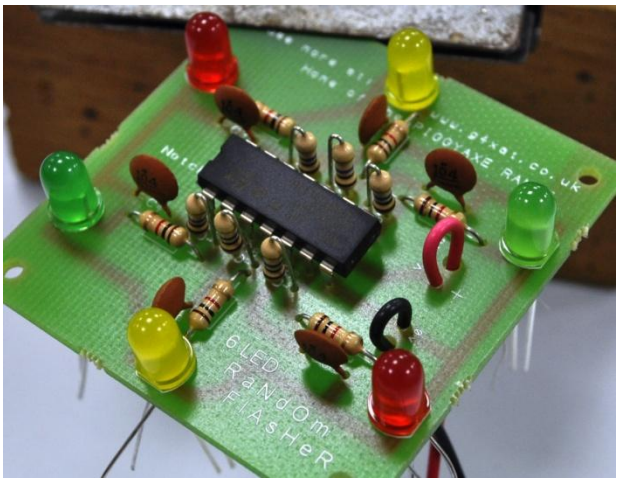
40106 CMOS Logic chip, PP3 battery snap, PCB, 6x 5mm LEDs (kit contains 2x red, 2x green and 2x yellow), C1 to C6: 100nF ceramic capacitor (brown disc marked 104), R1 to R6: 1kΩ resistor (brown-black-red-gold), R7 to R12: 10MΩ resistor (brown-black-blue-gold). If you want a faster flash rate make R7 to R12 something smaller such as 4.7MΩ. Flash rate is approximately 0.5 x R x C.

You will also need: a soldering iron with a stand and a wet sponge, a PCB holder of some sort, some solder and a pair of side cutters. Remember: soldering irons can burn you. You should wash your hands after handling solder.

Take great care to fit the components exactly where they are supposed to go, otherwise your circuit may not work as expected. Use the photographs below to help you place the components correctly.







Put a tick ✓ in each box as you solder in each part or, if you prefer, get someone to check your placement before you solder it. **CHECK TWICE – SOLDER ONCE!**

First of all bend the resistors R7 to R12 like this:  It makes them easy to fit around the chip.

Fit resistors R1 to R6 flat on the PCB and solder: Resistors R1 to R6 ❑

Next add the capacitors C1 to C6. It does not matter which way around they are fitted: Capacitors C1 to C6 ❑

Now solder in the vertical resistors you bent – put each one in the same way round: Resistors R7 to R12 ❑

Now fit the microchip taking care to match the notch at one end with the outline: 40106 ❑

Fit the LEDs making sure that the shorter leg (flat side) goes towards the OUTSIDE of the PCB (marked as -) ❑

Finally, fit the RED and BLACK wires from the battery box, up though the stress relief holes then down into the PCB and solder ❑

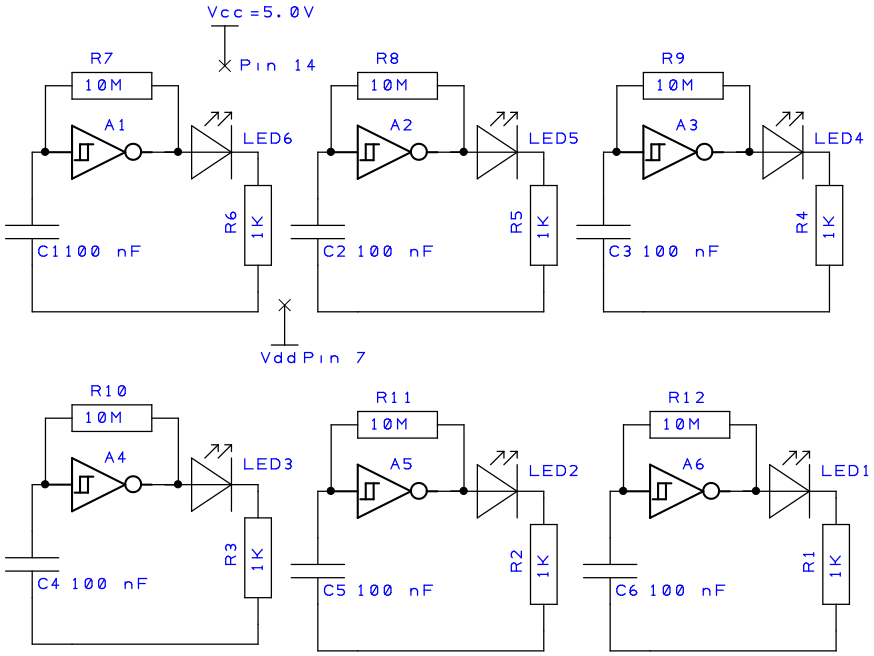
> **TIP!** Remember you can bend the legs on the LEDs to change the angle to suit if you want. Bend **then** solder. Or fit them into the holes in your design first to check, and solder them in place.

Now carefully check your soldering for errors (missed joints, bridges between parts that should NOT be connected or solder splashes). If it looks OK connect up to a battery pack. 4x AA batteries (6 volts) in a suitable holder, (e.g. Rapid order code 18-2909) will work well. Enjoy the spectacle. ☺

Fault-finding this circuit is fairly simple as it's basically six of the same circuits built around a single chip:

LEDs glow dimly – probably a vertical resistor or capacitor badly soldered.

LED does not light at all – LED fitted back to front or both legs joined by a solder bridge.



The circuit diagram is shown above. The power supply connections are shown as connected to pins 7 (-) and 14 (+). The PCB already includes these so they are shown for completeness only.

Different flash rates can be achieved by making resistors R7 to R12 smaller (this will increase the flash speed) or by making the capacitors larger (slower flash speed). If using an electrolytic capacitor the '-' side should be fitted towards the outside of the PCB. With the standard components, the flash rate is about once a second and can be calculated using the formula: F=0.5 x R x C.

The resistors in series with the LEDs are chosen to give a good brightness and reasonable battery life. If the value is reduced you will notice that the ON time increases and the off time decreases. It is not recommend to reduce their value below 220Ω.