Ultra-low-current LED flasher

Large complex projects are fun, but they take time and can be expensive. Sometimes you just want a quick result at low cost. That's where this series of *Electronic Building Blocks* fits in. We use 'cheap as chips' components bought online to get you where you want to be... FAST! These projects range from around £15 to under a fiver... bargains!

Ultra-low-current LED flasher

Here's a project that ticks all the boxes – it costs nearly nothing, is very easy to build, and is extremely useful. So what is it? It's an ultra low current LED flasher – but what use is that?

Well, if you need to have a 'power on' indicator on battery-operated equipment, this LED will consume far less power than a conventional LED. That way, the 'on' indicator is contributing only fractionally to flattening the battery.

Or take an indicator that needs to provide a security warning – like the flasher now fitted to many car dashboards or door cappings. Again, the requirement is for an indicator that takes very little current.

Fig.1. Any small battery-powered clock can be used as the basis of this project. You can buy them new very cheaply or salvage the workin s rom a discarded clock

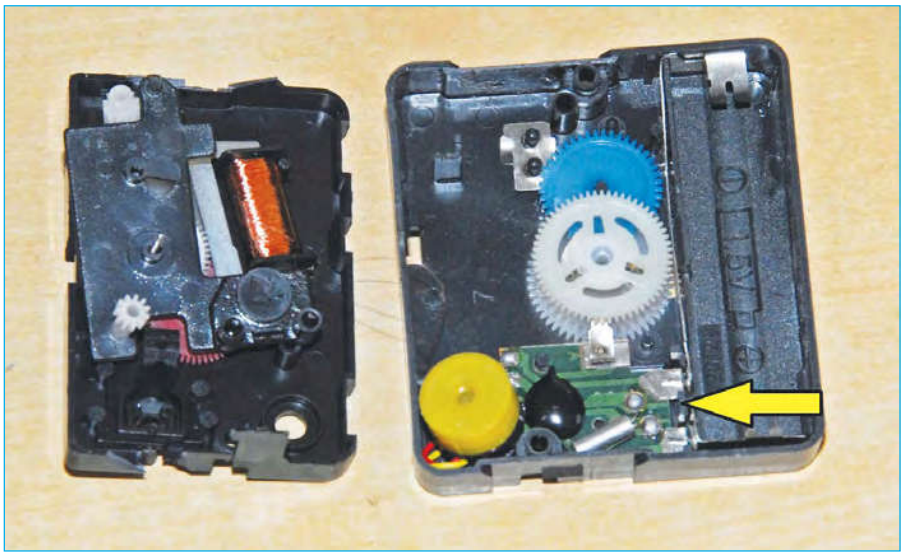

Fig.2. The clock's guts – disassemble the clock until you can remove the circuit board (arrowed). Before you do so, take special note of the polarity of the battery connections and which solder pads connect to the solenoid coil

Wherever you want to be able to find a camping lantern in a dark tent – just fit this flasher and you'll always know where it is. And you can leave it flashing all night without taking any more than a tiny current draw from the battery.

So, whatever warnings or indicators are needed, or if your requirement is for a flashing LED that can operate in a low-power environment, here is the LED flasher that you want. And best of all, it will take you only a few minutes to build and should cost virtually nothing in parts!

How long will it keep flashing?

So, just how long will the *Ultra-low-current LED* operate? I can't tell you – I have just about given up waiting for the battery in the test unit to go flat.

I rigged up a clock module and LED with a couple of alkaline AA cells I had lying around. They were certainly not new – I think their combined voltage was about 2.9V. I started the LED flashing and then left it to its own devices, working 24 hours a day.

After a week, it was still flashing happily. After another week – so over 330 hours – it was still going. And the battery voltage? It had dropped only 0.1V to 2.8V.

Given that a new pair of AA cells will give a voltage of about 3.2V, you can see that it is very likely that with new batteries, the LED would flash for months. Fit two D-cells and it may well flash for years. I told you it was low current!

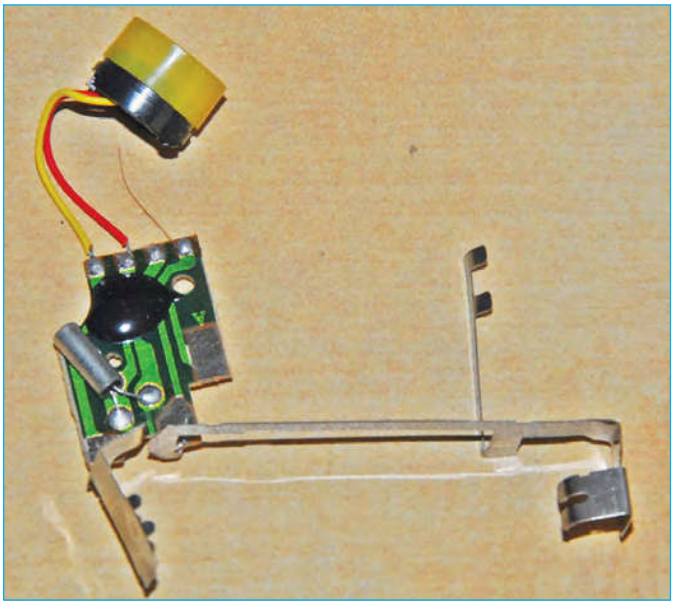

Fig.4. Connect 3V to the original power terminals (use the correct polarity!) and solder an LED directly across the solenoid coil outputs. Use flexible thin insulated wire for these connections

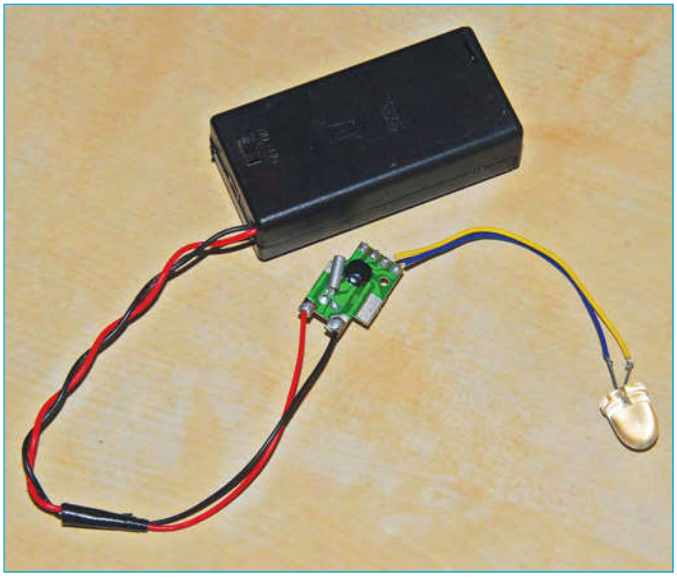

Fig.5. The completed LED flasher, ready for mounting in a box. The flasher will operate continuously for many weeks on a pair of alkaline AA cells. Used as a 'power on' indicator in battery-operated equipment, it draws only the tiniest of currents

The building block

The circuit board for this project is taken straight from a battery-operated clock. You can buy one new on-line for just a few pounds (and that includes delivery) or purchase one from a high street discount/Pound store. Or, you may simply have an old battery-operated clock that you can recycle.

Remove the circuit board from within the clock module. Carefully study (1) the polarity of the power connections to the board, and (2) the connections for the external solenoid coil that powers the clock mechanism. Many small alarm clocks also have a remote piezo buzzer – you don't need this, so remove it by snipping its wires.

Now it's time to make this module into a flasher. Simply connect a high intensity LED to the solder pads that once went to the solenoid coil. Then connect a 3V source to the power connections, observing the original polarity.

LED connection

It doesn't matter which way you connect the LED, and despite the clock originally being powered by 1.5V, it will work fine on 3V. But hold on! 'It doesn't matter which way you connect the LED' – how can that possibly be so?!

The clock module outputs a pulse every second – one is negative-going and the other positive-going. The LED lights only when its connection polarity matches the direction of the pulse. Furthermore, because the pulse is so short and the internal current source appears limited, you can drive pretty well any high intensity LED directly from the output without using a current-limiting resistor. (If you are worried by that, you can of course insert a series resistor.)

Flashing

The LED will flash once every two seconds with a 31ms (millisecond) pulse – a duty cycle of just 1.56 per cent. (At a measured 20mA current, you can now see why battery life is so long!) If you want a faster flash rate, just parallel another LED in reversed polarity to the first. The LEDs will flash alternately, an LED lighting once per second. You can also use two different colour LEDs – for example, you can have a green/red flasher.

Be very careful when soldering to the board. Always use small diameter flexible wires rather than solid-cored copper (as is used on the LED leads). If you don't use flexible wires, it's very easy to lift the solder pads off the board by bumping the connection.

The LED you use can be as large as the 10mm design used here, or as small as a 3mm unit. If you want a prominent warning, use a 10mm LED and cover it in a tube of semi-translucent plastic – I used the cap from a thick marker pen.

Fig.6. A coloured cap from a marker pen can be used over the LED to give a more diffused glow

Conclusion

It's a great project, and in my household, where everyone can see the 'test' LED flasher happily beavering away, it's become a conversation piece; 'when will the battery finally give up the ghost?', everyone asks. Anywhere you need a low-current 'power on' indicator or warning, it's perfect.