Build a joule thief

Disposable batteries often have quite a bit of life left in them when they will no longer power many devices. This kit allows you to drain the last remaining energy in those ‘flat’ batteries and provide you with usable light for several days per battery.

Most ‘flat’ batteries still have a lot of life left in them, it’s just that most battery-powered devices can’t extract this energy as the battery’s terminal voltage may have dropped below a level that the device can use.

The Joule Thief kit is a very simple circuit designed to step that voltage up so that it can be used by a superbright LED (light emitting diode) to provide a small mount of usable light.

The circuit will discharge the battery down to around 0.4 volts, at which voltage there is very little energy left in the battery.

How it works

The circuit is quite simple. When power is first applied, current flows from the battery through the 1K resistor and one winding of the transformer into the base of the transistor, turning it on. This causes a larger current to flow through the transistor via the other transformer winding.

This current causes the base current to keep trying to flow through the transformer, as do A1 and B1. If that doesn’t fix it, check the windings to make sure that you didn’t swap one end of the transformer in place with a dot of glue. Reverse the transformer, as do A2 and B2.

Now, place the four wires from the transformer into their appropriate holes on the circuit board and solder into place. Hold the transformer in place with a dot of glue. Remember that you must get the wires in the correct holes, or the circuit will not work.

The smoke test

Now to test your handywork. Get yourself a ‘flat’ AA battery that has a reasonable terminal voltage (at least 1 volt) and connect it to the circuit via the terminals marked + and – on the board. The LED should light immediately. If not, the most likely problem is that the switch is off (doh!) or the transformer is connected the wrong way. To fix the latter problem, unsolder the wires from the A1 and A2 positions and swap them over. If that doesn’t fix it, check the windings to make sure that you didn’t swap one end of the A and B windings somehow.

The circuit is very simple and uses only a few components. Note how the phasing dots on the transformer are at opposite ends, showing how the two windings are connected.