Bill of materials

I got all of this from either thonk.co.uk or uk.farnell.com

4x 2n2222 or 2n3904 resistors (Ideally you want two matched pairs but this isn't mandatory. I demonstrate the difference it makes around the 22 minute mark in this video: https://www.youtube.com/watch?v=WUzgErSsmqI. Thonk sell matched 2n3904s if you want them)
1x 40106 ic
2x alpha (or different brand alternative with the same footprint) vertical pots 10k lin
1x alpha (or different brand alternative with the same footprint) vertical pot 500k or 1M lin(see notes)
1x alpha (or different brand alternative with the same footprint) vertical pot maybe 50k? (Definitely see notes.)
1x TL32P0 SPDT switch
2x 5.6k resistor
3x 1k resistor
1x other resistor (like, you seriously need to read the notes)
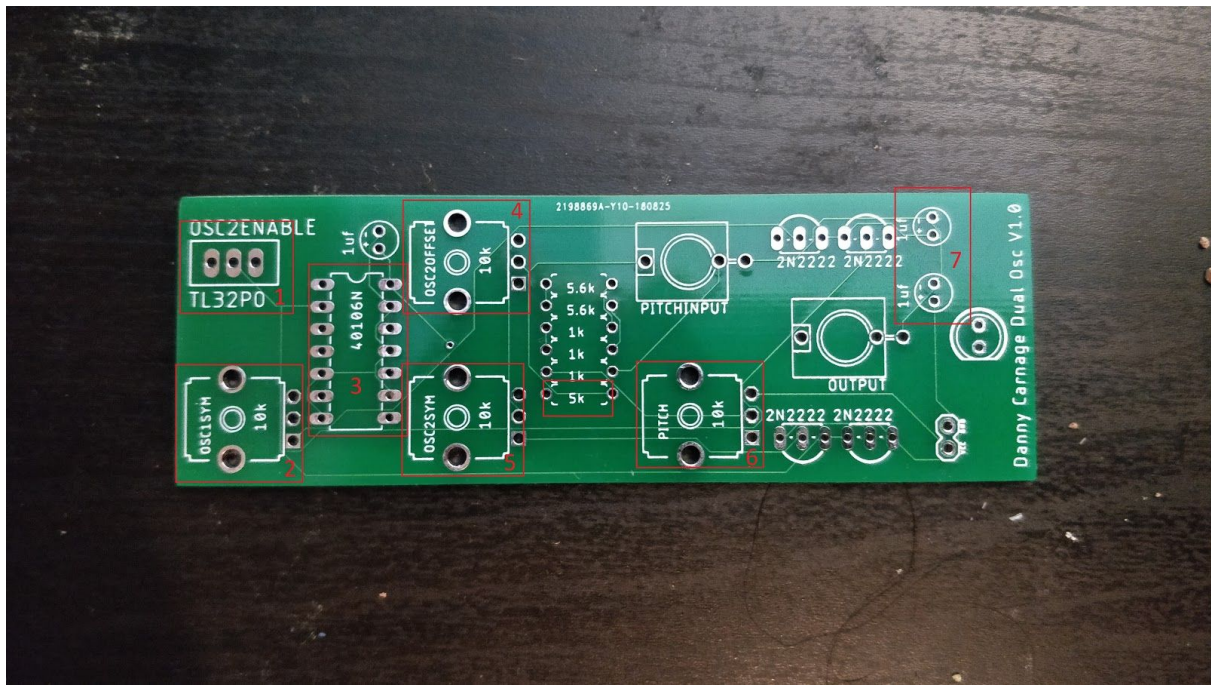2x Thonkiconn jack sockets
1x 5mm LED
3x Electrolytic capacitors (notes notes notes)
2x right-angle header pins (unless you solder power wires directly to the board)

Notes!

This thing works and makes cool noises but is the very first revision so has some teething issues. I am assuming you know how to solder components to a board so I'm not doing a step-by-step for that.

(numbers in brackets refer to the bits on this image)

On its own it functions as a 2-oscillator square wave synth with master pitch control (6), pulse width for osc 1 (2) and 2 (5), pitch offset for osc 2 (4) and a switch to enable/disable osc 2 (1). If you plug something into the pitchinput socket it overrides the master pitch control and pitch is instead controlled by the input signal. I have no idea if it's 1v/oct or what the hell. #Yolo.

Unfourtunately the component values specified on the board aren't necessarily accurate. Here's where things differ from what's printed (and why):

- The pitch range is derived from the value of the master pitch control pot (6) and the capacitor values at (7). Through a bit of experimentation I've worked out a 1M pot with 2.2uf capacitors gives a decent audible range but bigger value capacitors will mean you can go down to LFO speeds if that's what you want.
- The osc2offset pot value should be double the value of the resistor marked as 5K (which I've drawn a box around but have forgotten to number… D'oh!). The resistor is in series with osc 1 meaning when the osc2offset pot is half way (i.e. at 5k) it's the same pitch as osc 1. This does work as intended but the problem is 5k in each direction isn't enough of a pitch difference to be interesting (or really even noticable) and 5k resistors are rare and bloody expensive! I recommend using a 50k or even 100k pot and therefore either a 25k or 50k resistor here. It doesn't matter if you don't get exactly the right resistor - it just means the point where osc 2 is the same pitch as osc 1 won't be in the dead centre of the osc2offset pot. The next revision of this board will include a trimpot to allow you to calibrate this better.

When configured with 2 oscillators you will notice the sound is affected when you change osc 2 controls even if osc 2 is switched off. This will be fixed next revision but for now it at least gives different kinds of noises depending on the switch position!

You can also configure it as a single oscillator by missing out the components that only relate to osc 2 - basically miss out everything covered by a red box and use a 1k (or any value really) resistor for the bottom one:
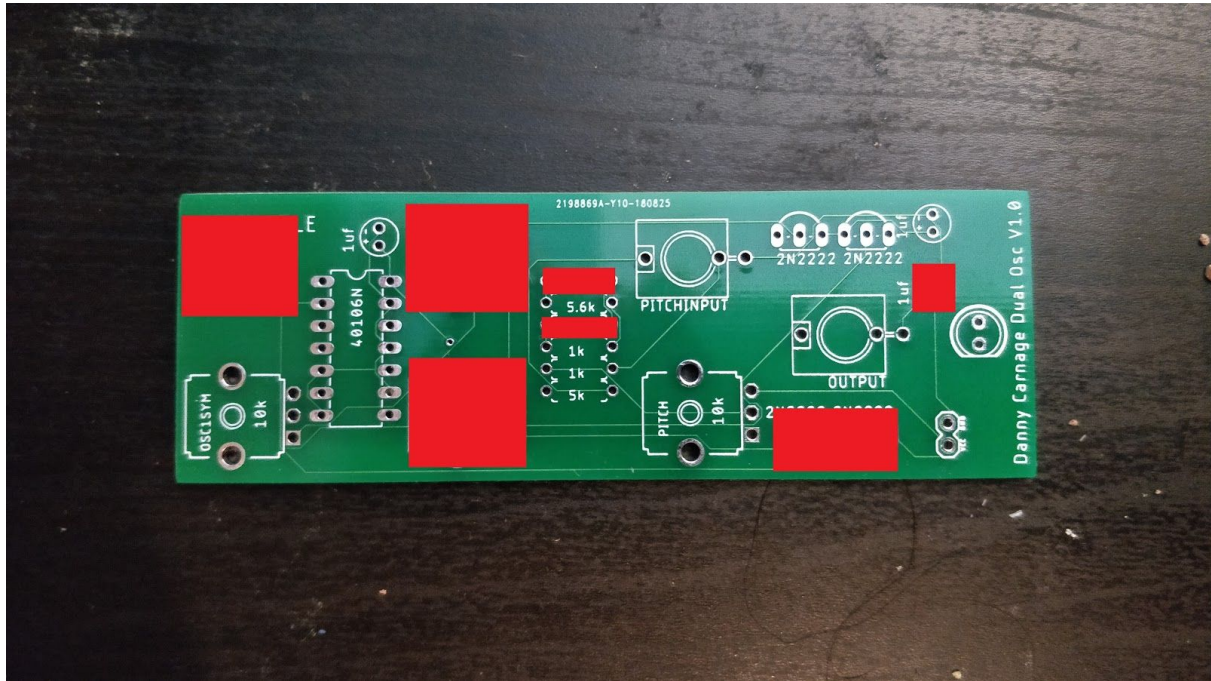
Be slightly careful soldering the 40106 onto the board - you don't have room to use a socket if you intend to mount this into an enclosure so just leave a bit of time between soldering each pin to avoid overheating anything. You may also need to bend the capacitors over if they're too tall - I've left room for this but you'll need to solder them with the legs not all the way in.

This is designed to run at 9 volts but the chip will take more/less (up to 20 volts according to the datasheet). Running at a different voltage will affect the pitch so you'll need to figure out the right combination of pot/capacitors for your voltage. You also might need to change out the 5.6k resistors depending on how the LED behaves. I have only run them at 9 volts so if you choose to do otherwise you're kinda on your own.