

drumkid

Kit assembly instructions

This guide will take you through the process of building your DrumKid step by step. If you are missing any components, or if you need any help with the assembly, please send me an email (matthewloydradshaw@gmail.com).

Overview

Here's a quick list of the steps you're going to go through:

- Check parts
- Solder smaller components to the underside of the PCB
- Solder all components to the top side of the PCB
- Solder MIDI sockets and battery box leads to the underside of the PCB
- Insert the chips
- Insert batteries (if using them)
- Screw everything together
- Make music

Parts

Please check that your kit contains all of the following parts:

Component	Value/type	Quantity	Notes
Resistor	220Ω	5	Red red brown gold
Resistor	270Ω	1	Red purple brown gold
Resistor	470Ω	1	Yellow purple brown gold
Resistor	680Ω	6	Blue grey brown gold
Resistor	10KΩ	1	Brown black orange gold
Diode	1N4148	1	Smaller diode
Diode	1N5817	1	Larger diode
Capacitor	470μF	2	
Capacitor	22μF	1	
Capacitor	100nF	1	Marked "104"
Slide switch		2	
Header	15-pin female	2	
Audio socket	3.5mm stereo	1	
Button		6	
LED		6	
Potentiometer	10K linear	5	
MIDI socket		2	

Component	Value/type	Quantity	Notes
M3 thumb screws	6mm, nylon	6	
IC socket	8-pin	1	For optoisolator
Optoisolator	6N138	1	
Microcontroller		1	Arduino Nano compatible
M3 machine screw	6mm, pan head	6	
M3 machine screw	10mm, countersunk	2	
M3 dome nut		2	
M3 hex nut		2	
M3 standoff (female/female)	25mm	6	
M3 standoff (male/female)	5mm	4	
Rear panel		1	Larger plastic panel
Front panel		1	Smaller plastic panel
DrumKid PCB		1	
Battery box	3xAA	1	

Soldering

DrumKid is designed to be relatively easy to solder. All of the components are "through-hole", which means that you poke the leads through the holes and then solder them in place on the other side, before trimming the leads if they stick out. The only aspect of DrumKid that is a little counter-intuitive is that some components are soldered on the front of the board, and some on the back. I've included some pictures to show where everything goes, and there are also some hints printed on the PCB itself.

One other thing that is potentially slightly confusing about DrumKid is that I have included some spaces on the PCB for extra components in case you want to customise your DrumKid in the future. Don't worry if you get to the end and find there are still holes with no components in them - that's normal!

If you're unsure about soldering, this online guide is a great place to start:

<https://learn.adafruit.com/adafruit-guide-excellent-soldering>

I've found that the best way to assemble DrumKid is to start by soldering the components on the underside of the PCB (resistors, capacitors, etc), then solder the components on the top side (buttons, LEDs, etc), and finally flip the board back over to solder the last couple of chunky components on the underside. It's much easier if you solder everything roughly in order of size, starting with the smallest components. Here's the order in which I solder everything, along with some hints:

- Resistors (pay attention to the colours to make sure you get the right values, and bend the leads outwards to keep them in place)
- 1N4148 diode (be careful of the polarity - match the stripe to the stripe on the PCB)
- 1N5817 diode (again, careful of the polarity - match the stripe)
- IC socket (8-pin socket for the 6N138 chip)

- MIDI/Arduino switch (make sure the moveable part of the switch is nearest the outside of the board for easy access)
- Headers (15-pin sockets) for the Arduino (check the spacing matches the Arduino's pins - use the middle of the three available rows on each side, start by soldering just one or two pins and get the headers properly aligned before soldering all the pins)
- Capacitors (careful of the polarity for the larger 470 μ F and 22 μ F capacitors – the white stripe on the capacitor lines up with the white half of the circle on the PCB)
- Flip the board over...
- Audio output (make sure it's straight before soldering all the pins)
- Power switch
- Buttons
- LEDs (careful of the polarity - the long legs are positive) (also, it's a bit fiddly to get the LEDs aligned with each other - solder just the positive legs first to make it easier to realign the LEDs if needed)
- Potentiometers (these should snap into place)
- Flip the board back over again to solder the last couple of chunky components on the underside of the board...
- MIDI sockets (make sure they're flush against the board and not wonky)
- Battery box leads (red is positive and black is negative)

At this stage, check that you don't have any electrical components left over. If you do, solder them in place.

Assembly

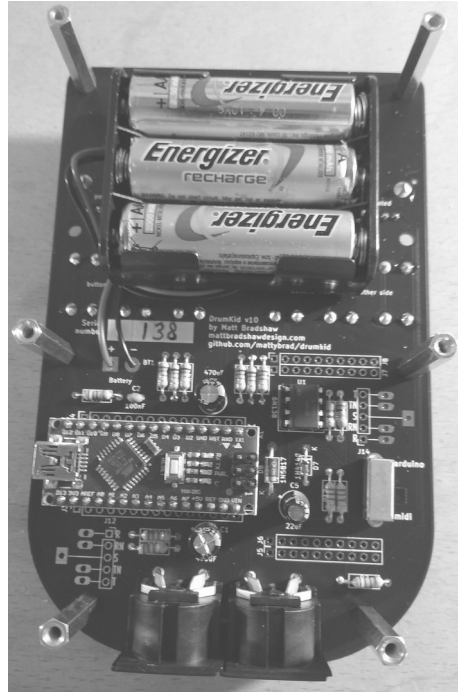
Once you're done with soldering, there are a few other steps before your drum machine is finished:

- Insert the 6N138 optoisolator (taking care not to bend the pins, and making sure the writing on the chip aligns with the label "6N138" on the PCB)
- Insert the Arduino Nano-compatible microcontroller (with the USB port nearest the edge of the PCB)
- Push the two countersunk screws through the bottom of the battery box from the inside (they should fit nicely into the two sloped holes), and tighten the two hexagonal nuts from the underside of the battery box (these nuts will act as spacers to keep the battery box lifted slightly above the component leads)
- Poke the two protruding ends of the battery box screws through the holes from the underside of the PCB, so that they stick out on the top side – you may want to loop the battery leads under the battery box to keep them out of the way
- Screw the two dome nuts onto the ends of the screws by hand, then tighten with a screwdriver to secure the battery box to the PCB
- Insert three AA batteries (if you are using them) or connect a USB lead, and check that the unit turns on and makes a sound when you press "start/stop" (make sure the volume is not turned down)
- If your unit is not working, check to see that everything is soldered correctly
- From the top side of the PCB, push the four shorter stand-offs (the things with a threaded hole in only one end) through the four lower-down holes (below the buttons) and screw them firmly into the longer stand-offs
- Again from the top side of the PCB, push two pan-head machine screws through the holes in the top-left and top-right corners and screw firmly into two long stand-offs
- Remove any plastic film from the two plastic panels
- Secure the smaller panel to the shorter stand-offs on the front of the board using pan-head machine screws

- Carefully secure the back panel using the six plastic thumb screws. You should tighten with your finger and thumb, not a screwdriver, and be careful not to force them – move them back and forth slightly until you find the thread, and don't over-tighten them

Pictures (go to bit.ly/2TYxYdS for higher resolution colour versions)

A few pictures to show you roughly what you're aiming for during assembly:



You should now have a finished, working drum machine. To read the main operating manual or to view a video tutorial, go to mattbradshawdesign.com/drumkid

Next steps – hacking...

If you're interested in adding extra features to your DrumKid, you will notice that I have included extra spaces on the PCB. There are extra "breakout" rows for all of the Arduino Nano pins, footprints for two extra 3.5mm audio sockets, and some extra unconnected rows of pins, which I imagined could be a useful place to mount a small stripboard circuit. Additionally, I've include two M3 holes between the buttons and the potentiometers, which can either be used for mounting a larger extra circuit (perhaps in place of the battery box) or for mounting a small alternative front panel with different parameter labels, if you end up reprogramming the firmware. I'm aiming to make some videos of possible DrumKid hacks soon, so keep an eye on the website.