



## OVERVIEW

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For the most recent version of this document please visit - <https://www.thonk.co.uk/shop/pulses-mk-ii-full-kit/>

Refer also to the Music Thing documentation here - <https://github.com/TomWhitwell/Turing-Pulse-Expander>

For all technical support please create a Github account and log an issue here - <https://github.com/TomWhitwell/TuringMachine/issues>

Chat about the build here – BUILD SUPPORT THREAD <https://modwiggler.com/forum/viewtopic.php?t=159116>

All Thonk kits are sold under our standard Terms and Conditions - <http://www.thonk.co.uk/faq/>



## DIY INSTRUCTIONS

This document gives detailed instructions that assume you have purchased a complete kit from [www.thonk.co.uk](http://www.thonk.co.uk). It also assumes no previous knowledge of electronics.

To learn to solder try <https://www.youtube.com/watch?v=IpkkfK937mU&t=0s> and the **Adafruit guide to excellent soldering** – <http://bit.ly/1177tF4>

**Watch and understand that whole YouTube video! If you're not achieving the results shown in the video then you need to buy new tools or seek advice.**

**You will not end up with a working module otherwise.**

## TOOLS REQUIRED

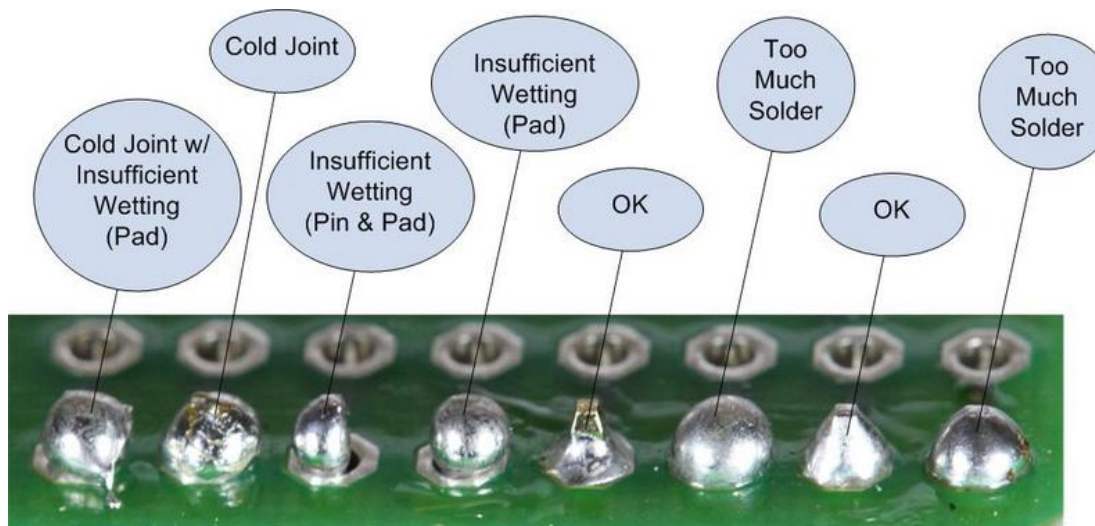
Soldering iron, snipe nose pliers, wire strippers, small flat head screwdriver and diagonal cutters AKA snips AKA side-cutters. A Digital Multimeter is always helpful for checking for bad solder joints and continuity. Thonk sell a range of inexpensive tools here - <http://bit.ly/1jxqF3n>



## SOLDER JOINTS

Your solder joints should look like those shown as 'OK' below, they should have that neat conical shape on **BOTH sides of the PCB**. If they don't look the same on both sides then stop! Work out why from the soldering guides linked and don't continue until you are getting those results.

This isn't just OCD talking, you are very likely to end up with a destroyed, damaged or defective unit if you're not hitting that standard.



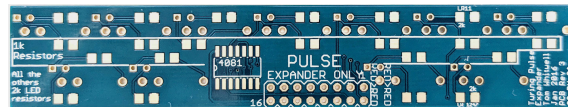
This photo is from the [Adafruit guide to excellent soldering](http://adafruit.com/guides/adafruit-guide-to-excellent-soldering) and is reproduced under an Attribution-Sharealike creative commons license - <http://creativecommons.org/licenses/by-sa/3.0/>



## PULSES EXPANDER BUILD INSTRUCTIONS

This Pulses kit is a simple build using larger surface mount components. It does however require good soldering skills as well as patience and care, due to the nature of SMD components.

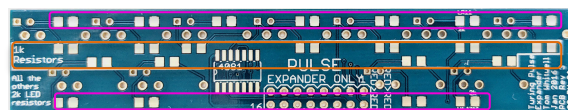
As a general rule you should be aiming to heat a single pad for no more than 3 seconds to prevent any irreversible damage to the PCB whilst still achieving smooth solder joints.



1.

To start this build first identify the separate 1K and 2K resistor bags.

The 1K resistors are located through the middle of the PCB and 2K resistors on both edges.



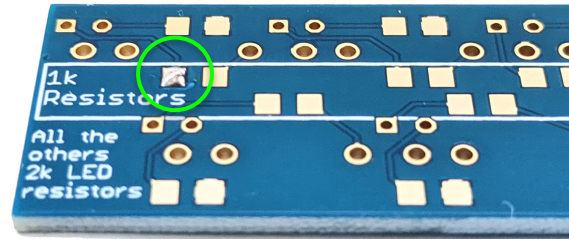
**11 of each resistor are required for this build though we have included 2 extra of each value in case of any errors.**



2.

First start with the row of 1K resistors located through the middle of the PCB.

Each resistor should be carefully positioned on the PCB so that it is flat and parallel to the board and the component is sitting equally in the middle of the pads either side.

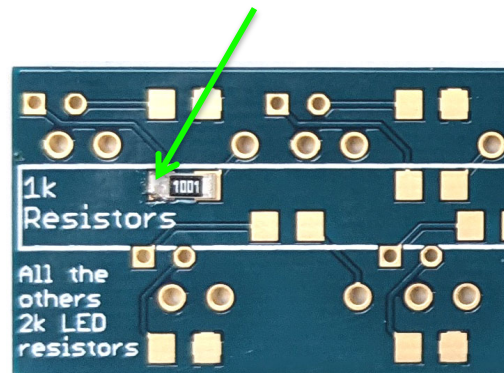


Add a blob of solder to a single pad by heating the pad for a few seconds before applying a small amount of solder.

3.

Using a pair of SMD suitable tweezers place a single 1K resistor (marked “1001”) onto the pad whilst simultaneously reheating the solder applied in the previous step.

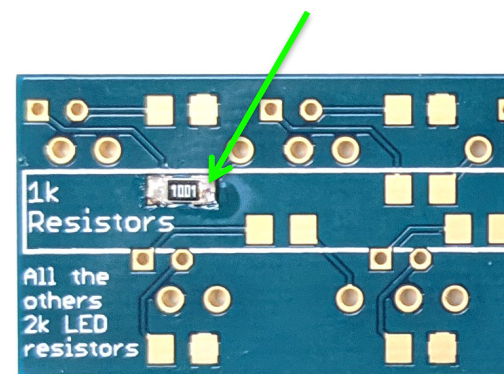
Pause and check you are happy with the position of the resistor as at this point only one pad is required to be reheated for any adjustment necessary.



4.

When the resistor is secured to the first pad and you are happy with the positioning then the second pad can be soldered.

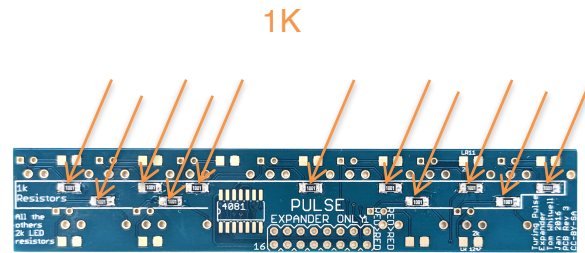
This is achieved similarly to the previous step. This time you can heat both the pad and the resistor together before applying solder and successfully securing the resistor on both ends.



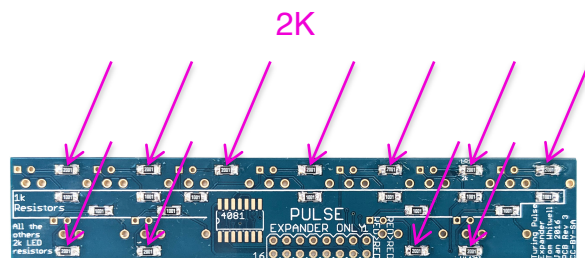


5.

Working through one value at a time, apply all resistors to the PCB repeating steps 2 to 4 for each resistor.



Remember there should be two of each value resistor left spare providing there were no issues during the build.

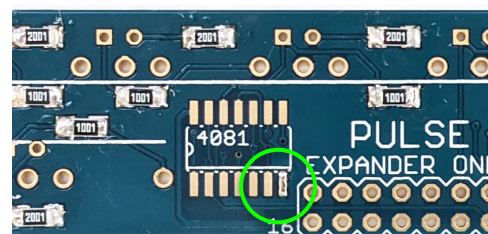


6.

Once all resistors have been soldered in position it's time to move onto the IC. The body of the chip and footprint on the PCB should match with the text '4081'.



IC's are sensitive devices so always take care when handling and be sure not too overheat them during soldering. Doing so could end up with a faulty or not working module.



To apply the IC a similar approach can be used as previously with the resistors, first by adding a small blob of solder to a single corner pad.



7.

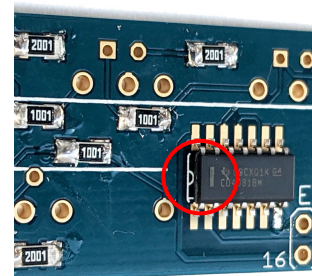
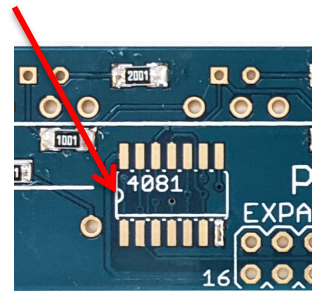
With solder applied to the pad, bring the IC to the board, again using a pair of tweezers.

Ensure the IC is positioned correctly with the white line marked on the body of the component placed over the notch on the PCB outline. Then check all legs of the IC line up with their corresponding pads.

**ORIENTATION IS VITAL**

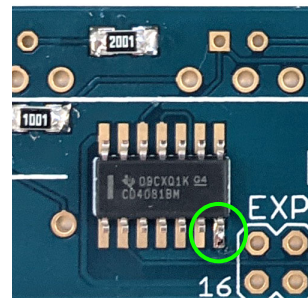
With the IC soldered incorrectly the module will not work and could result in destroying the component.

Notch



8.

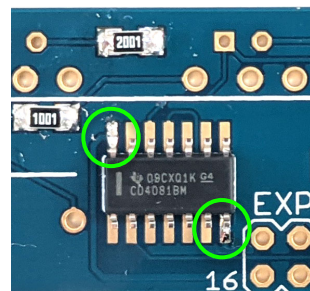
Once the IC is positioned correctly, reheat the solder already applied and secure the corner most leg of the IC to the pad.



9.

Before moving onto all legs of the IC first solder the diagonally opposite corner, securing the IC at both points as shown in the image.

This is a good chance to pause and check orientation and position of the IC. With only 2 legs soldered there is some leeway to reflow the solder joints and adjust the position if necessary.

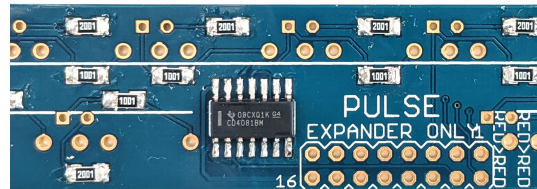




10.

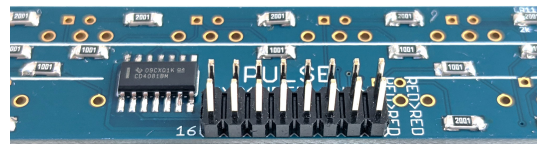
When you are happy with the position of the IC go ahead and solder the remaining legs to the board.

Remember to heat each leg and corresponding pad for a couple of seconds before applying solder to ensure a smooth joint and preventing the need to return and correct any mistakes.



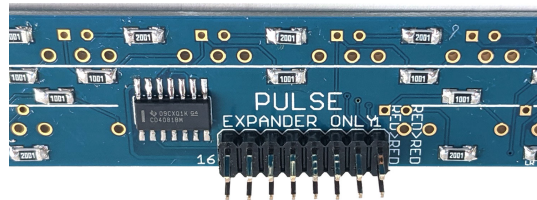
11.

Next find the 2x8 pin male header and place on the same side as all other components so far, soldering the pins from behind.



**Solder 1 corner pin into position first so you can reflow and readjust if necessary.**

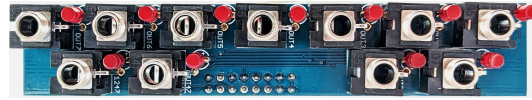
This is the header that connects the expander to the main Turing module and it's important that it lays flush to the PCB surface.





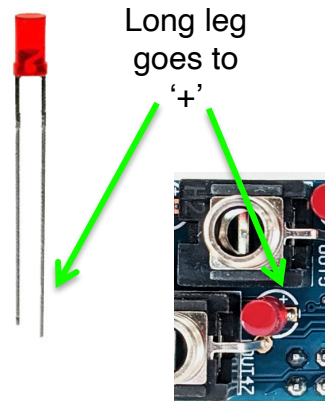
12.

The next step is to place the LED's and jacks and attach the front board. These are placed on the opposite side to all other components.



**DON'T SOLDER YET!**

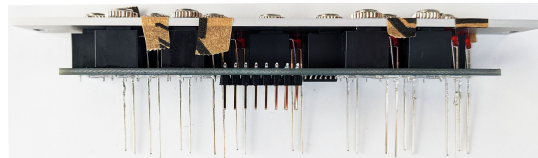
Double check the LED's are placed correctly with the long leg placed in the hole marked with a '+'.  
'+'.



**ORIENTATION IS VITAL**

13.

Put the panel in place over the LED's and jacks ensuring it is parallel to the PCB. Use the jack nuts to secure it.



14.

Before soldering use a small piece of tape over each LED to keep them flush against the panel.

**Only use masking tape to prevent damage and leaving any residue on the panel/components.**





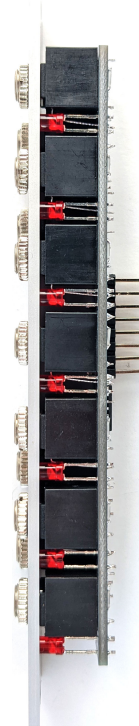


15.

With everything lined up correctly now is the time to solder all jacks and LED's.

There should be 55 points to solder in total. Double check none have been missed as this is an easy mistake to make at the end of a build and can cause the need for unnecessary troubleshooting.

When complete, trim the legs of all LED's with a pair of side cutters.



16.

The module is now complete.

Affix the 16-pin ribbon cable to the header following the orientation of the red stripe as pictured. The red stripe should sit next to the text marked 'RED>RED'.

**DO NOT CONNECT THE  
MODULE DIRECTLY TO POWER**

The other end of the cable will attach to the 'Pulses' header on your Turing machine again following the orientation labelled on the Turing PCB.

