BYO Java RetroPi Gaming Console

Stephen Chin (@steveonjava)
Lead Java Community Manager
JavaOne Community Chair

JavaOne™
ORACLE

Java Community Management is pretty hard…

314
Java User Groups

9M+ Java Developers

150+
Java Champions

50+ JUG groups contributing to JCP

NEW CHALLENGER!!!

Emulating the NES is a real challenge!

Nintendo Entertainment System

61 Million Units Sold Worldwide

826 ROMs to Test

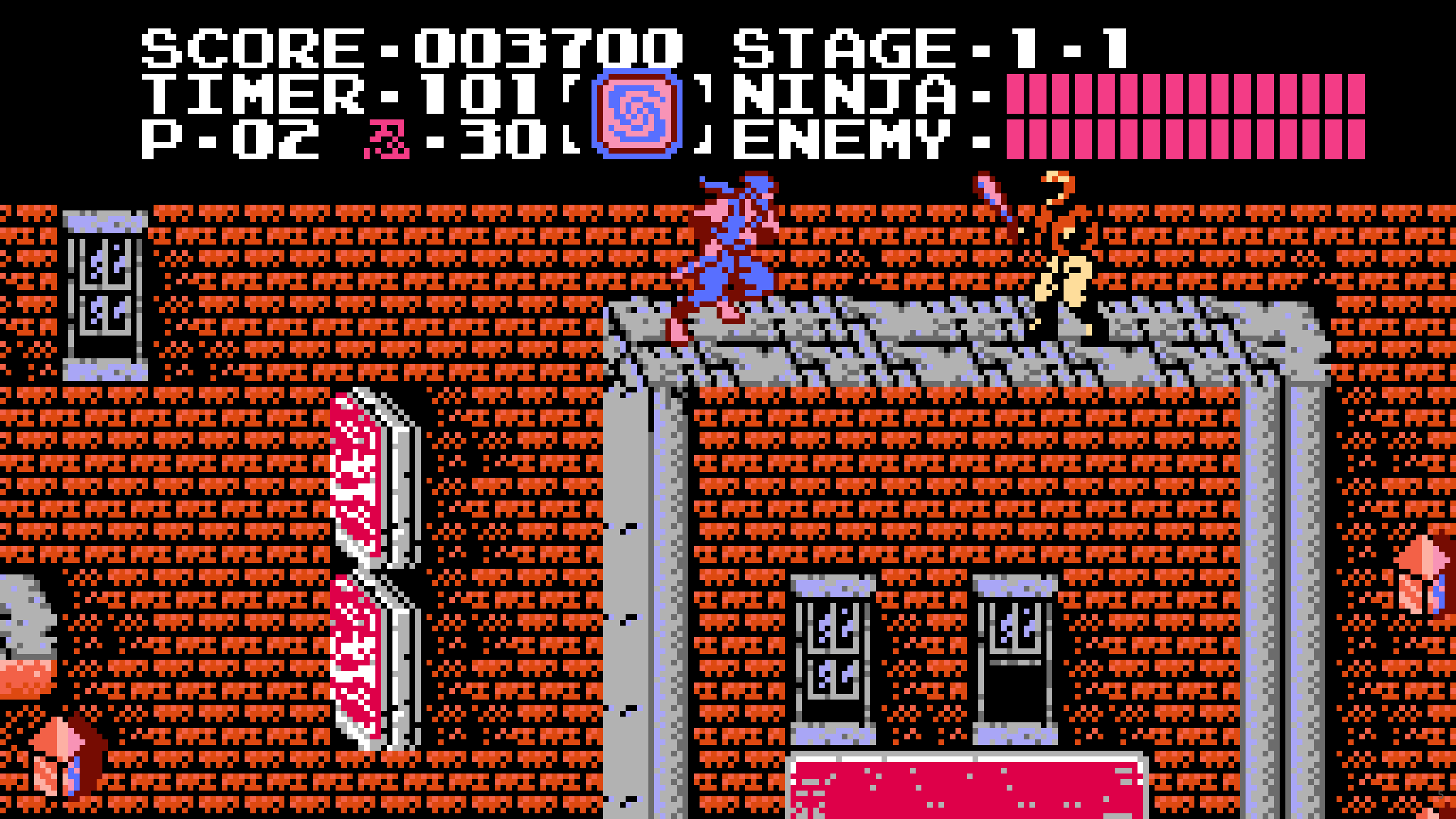
Plus Homebrew!

3,510 Transistors

92M Synchronization Points

https://commons.wikimedia.org/wiki/File:RP2A07.jpg

JavaOne™ ORACLE

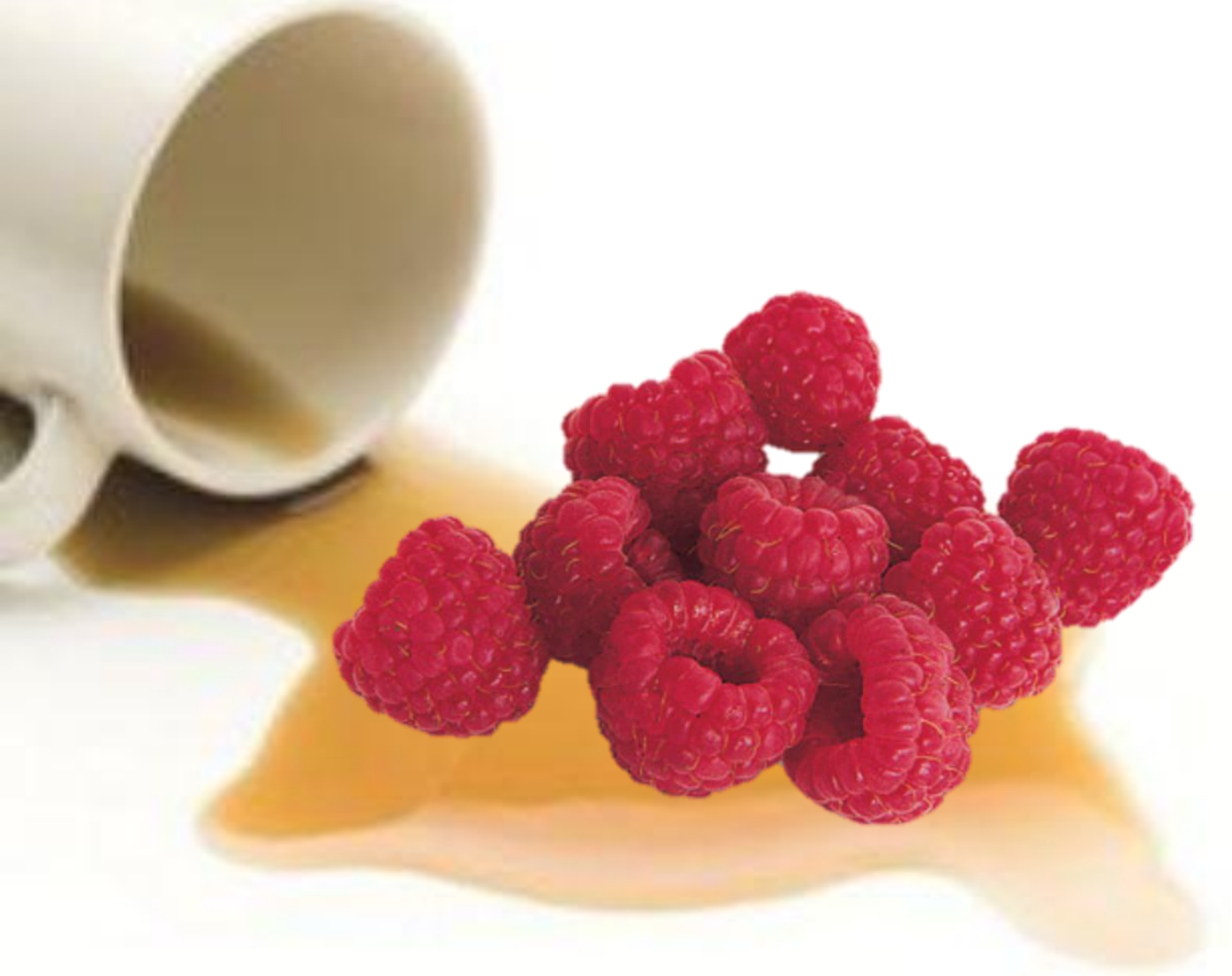

SCORE-003700
STAGE-1-1
TIMER-101
NINJA-
P-02
忍-30
ENEMY-

Up-Up-Down-Down-Left-Right-Left-Right B, A, Start


MARIO
005100
×09
WORLD
1-1
TIME
NIGHTHACKING RETRO

Electronics

Have Java With Your Dessert



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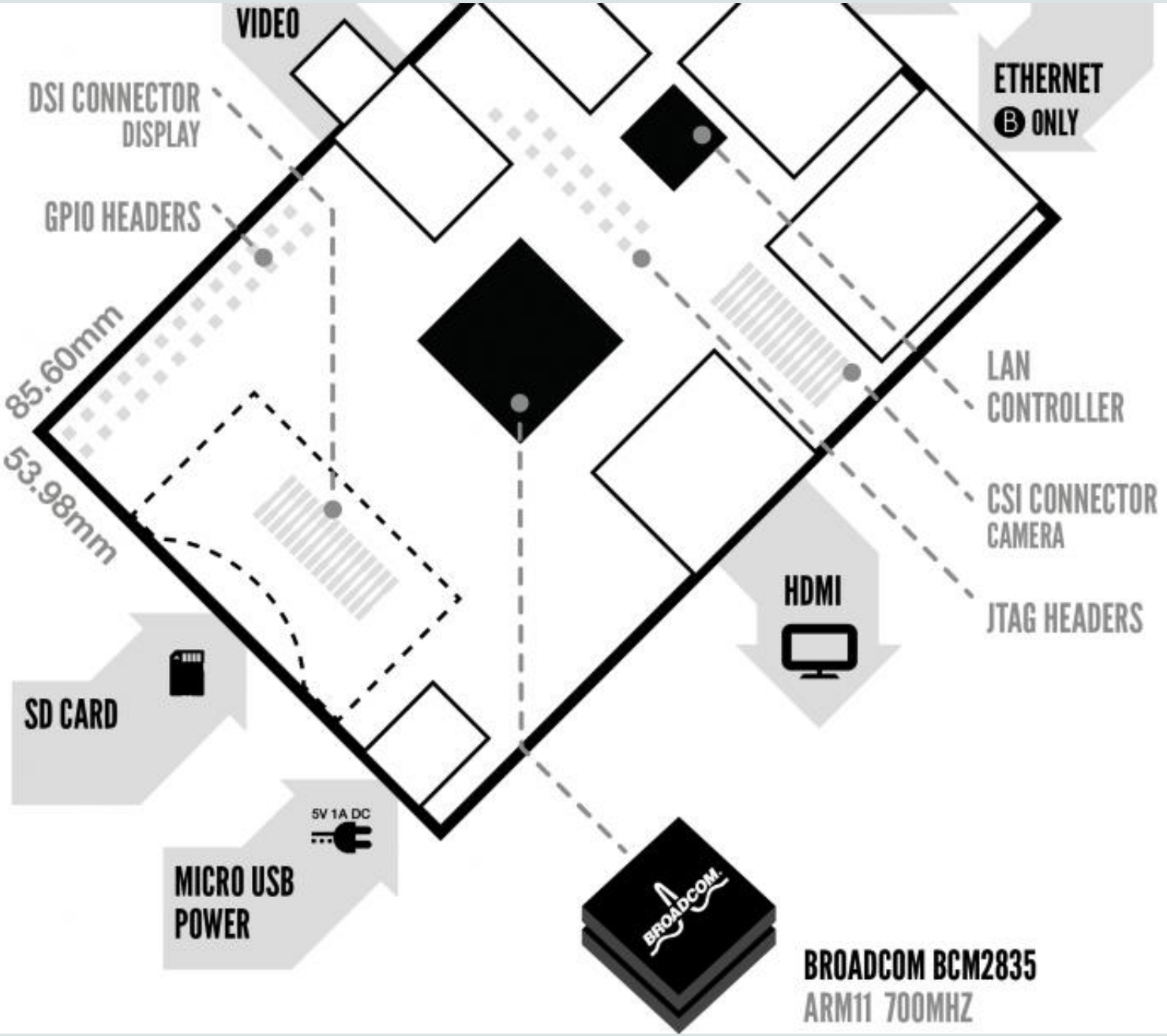
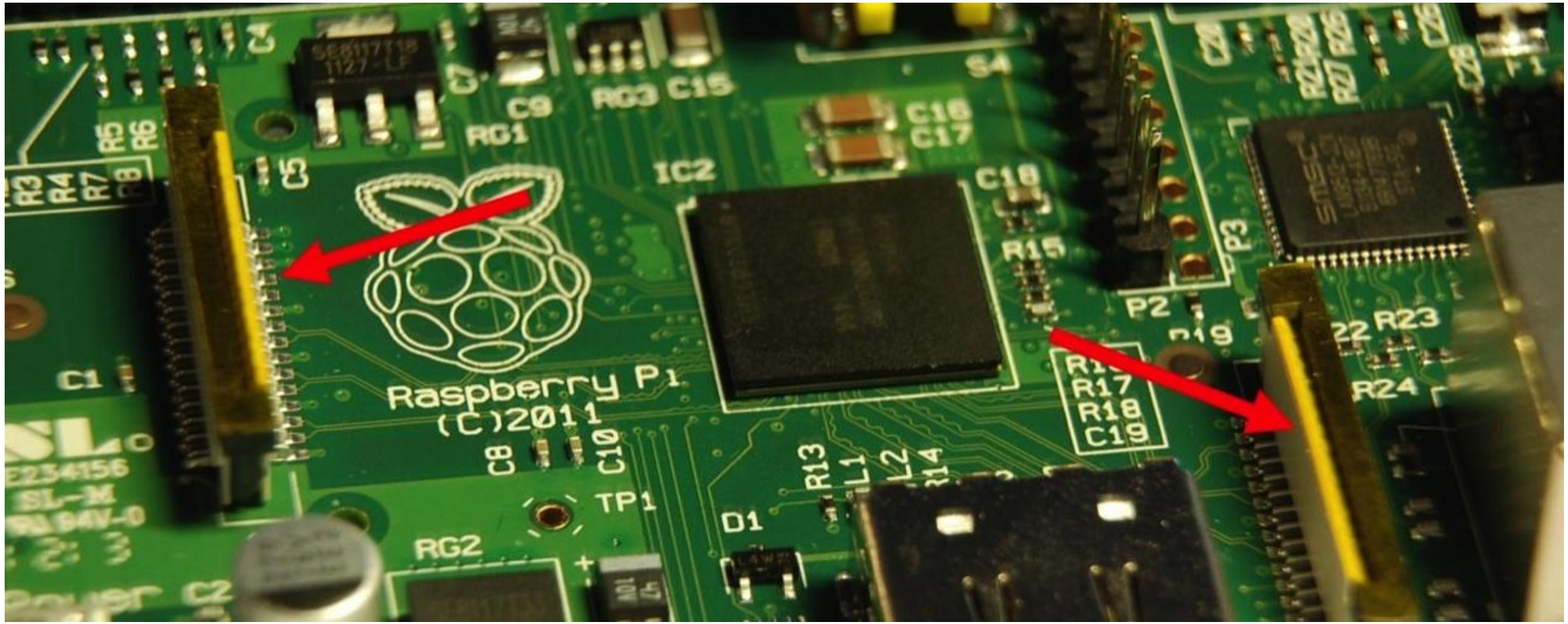


http://elinux.org/File:Raspi-Model-AB-Mono-2-699x1024.png

And what are these for?



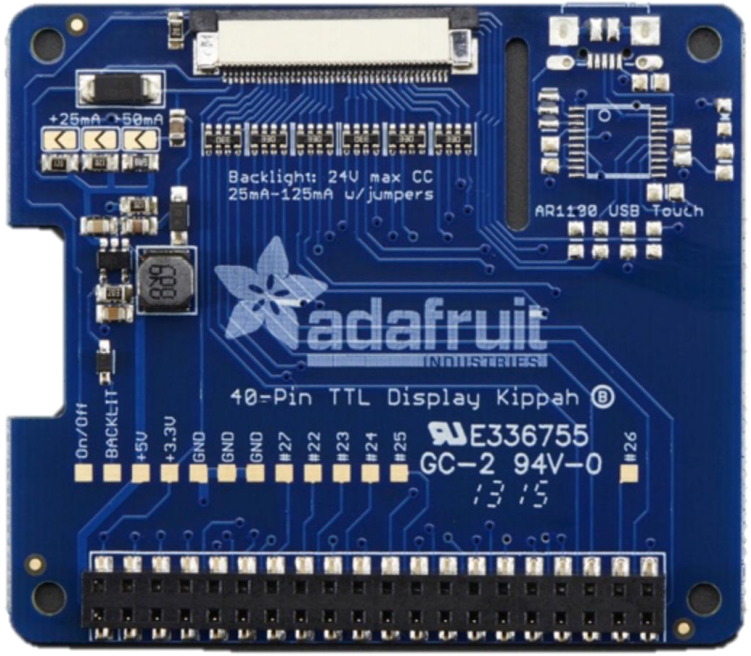
http://i.imgur.com/k0Puu.jpg

Portable Display Options

Graphics Bus	Quality	Speed	Power Usage

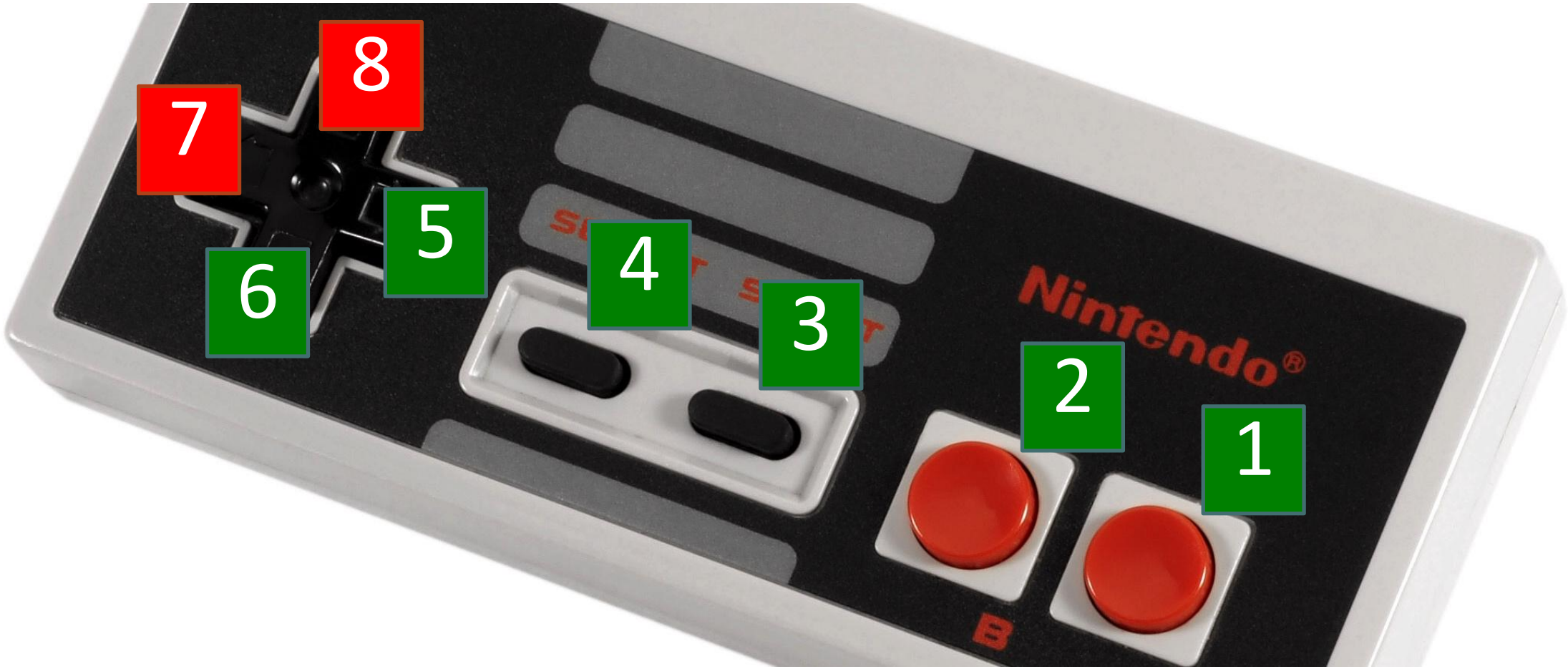
Adafruit Kippah

- Connects to 40 pin LCD connector
- Connects display via Device Tree GPIO
- Powers Display off Raspberry Pi 5V VCC
- Optional touch support via USB



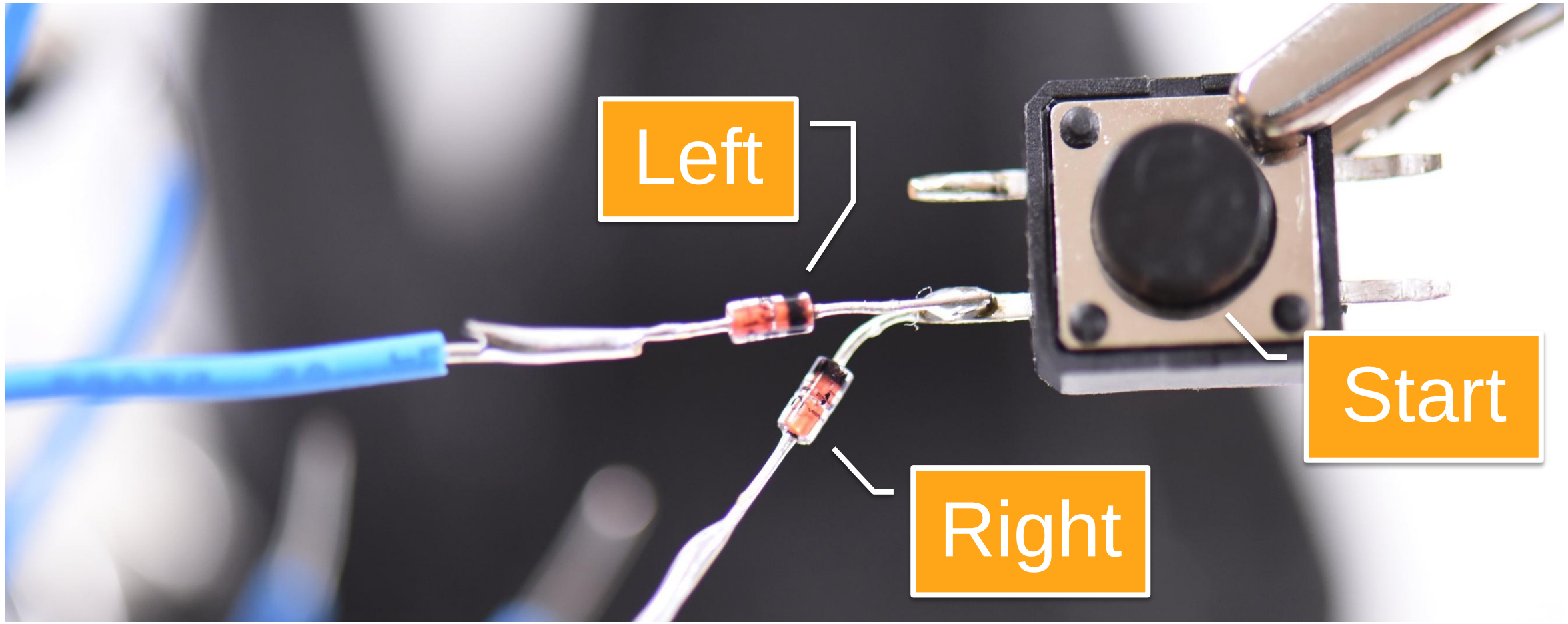
- Uses I2C, UART, and SPI pins… only 6 GPIO left over

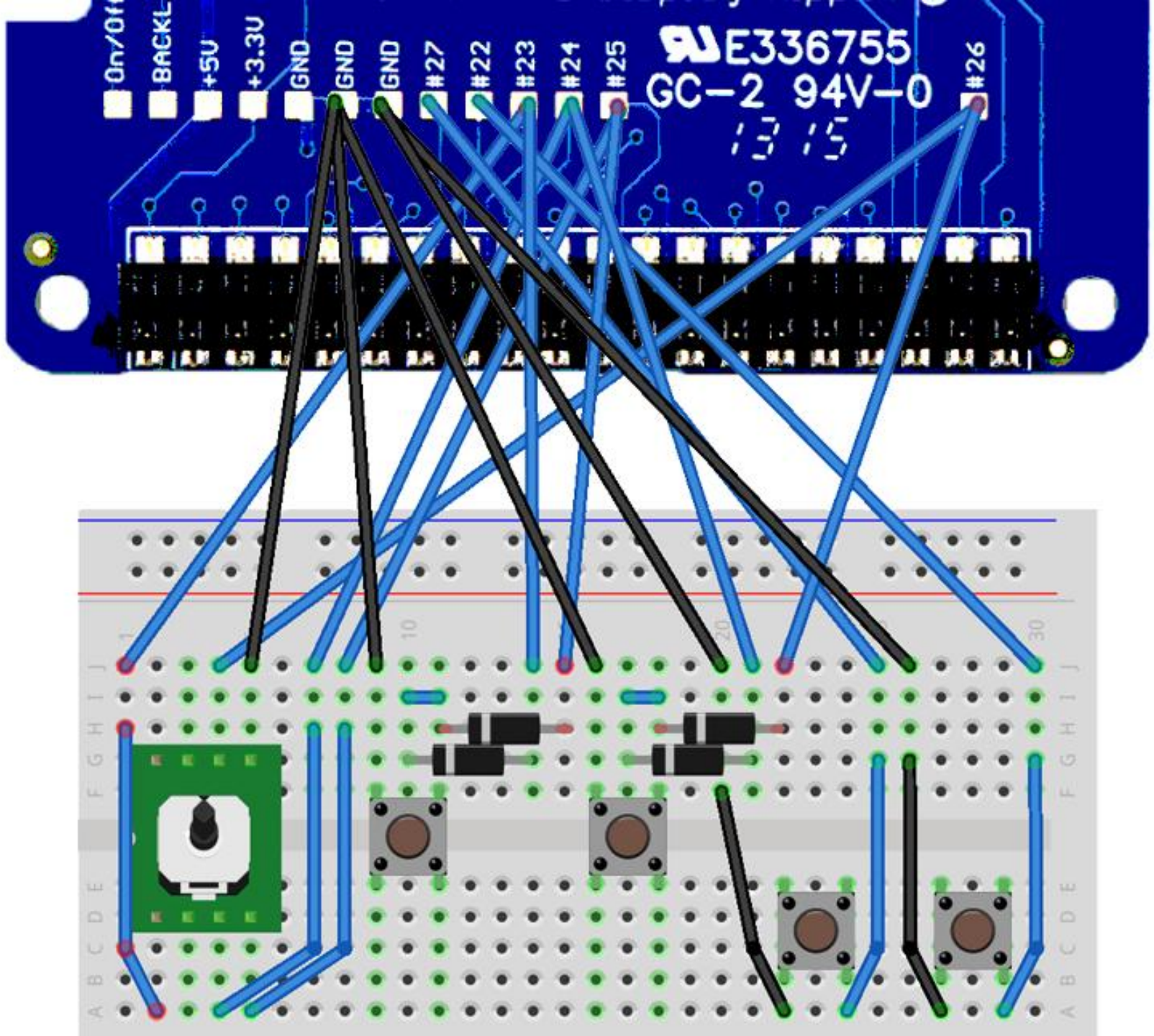
NES Controller



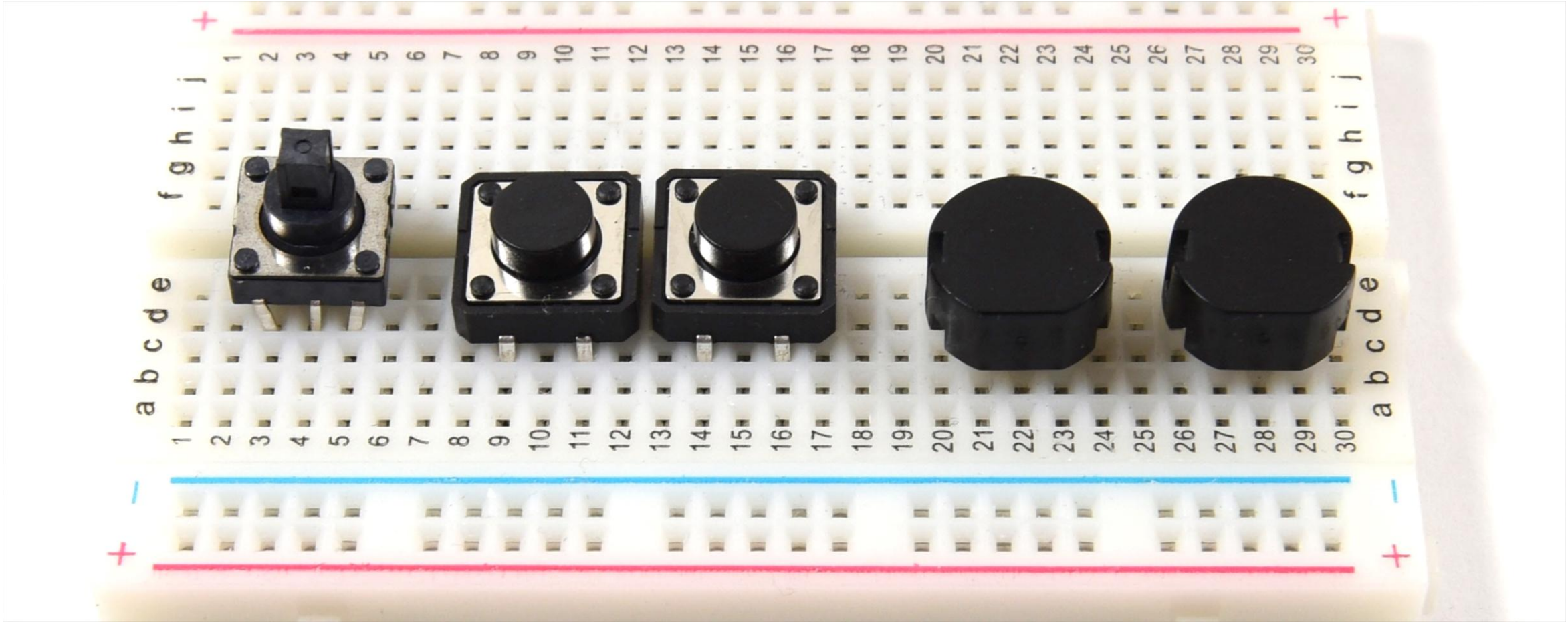

MARIO
090850
×21
WORLD
1-4
TIME
235

Diodes to the Rescue!

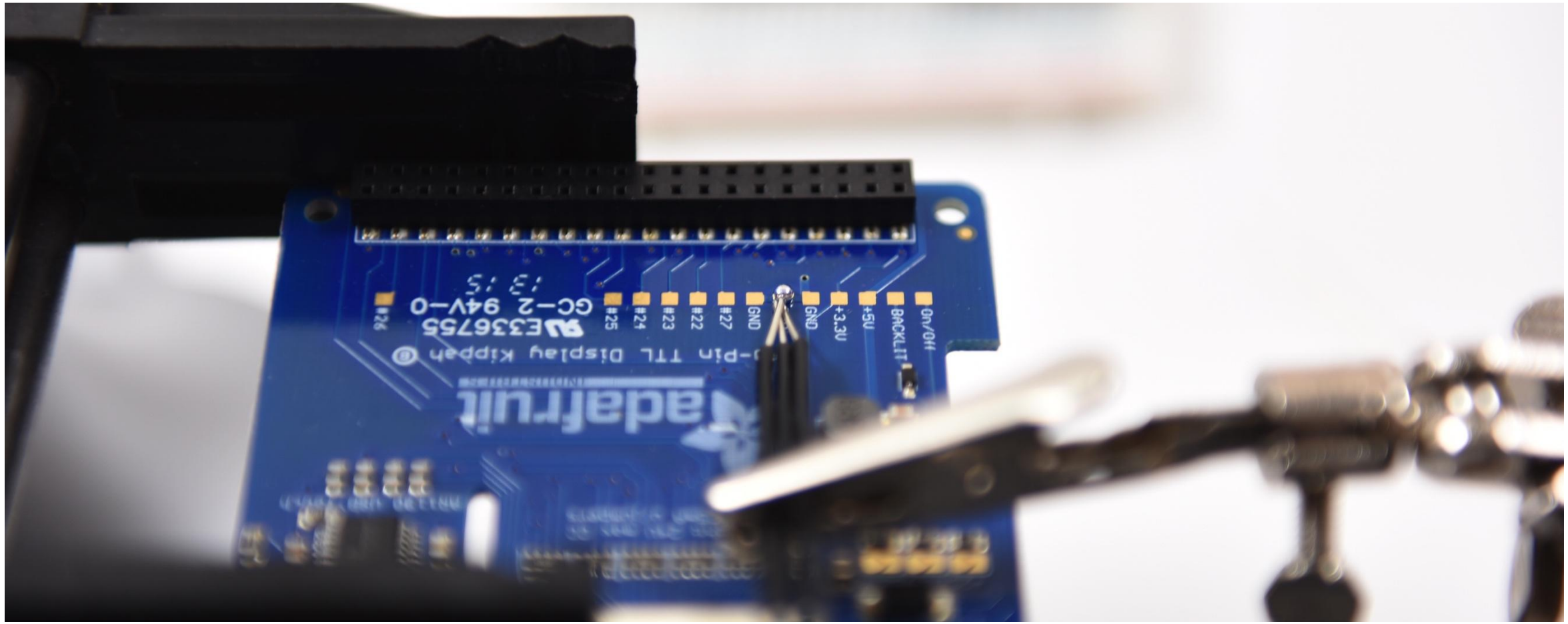



On/Off
BACKL
+5U
+3.3U
GND
GND
GND
#27
#22
#23
#24
#25
#26
E336755
GC-2 94V-0

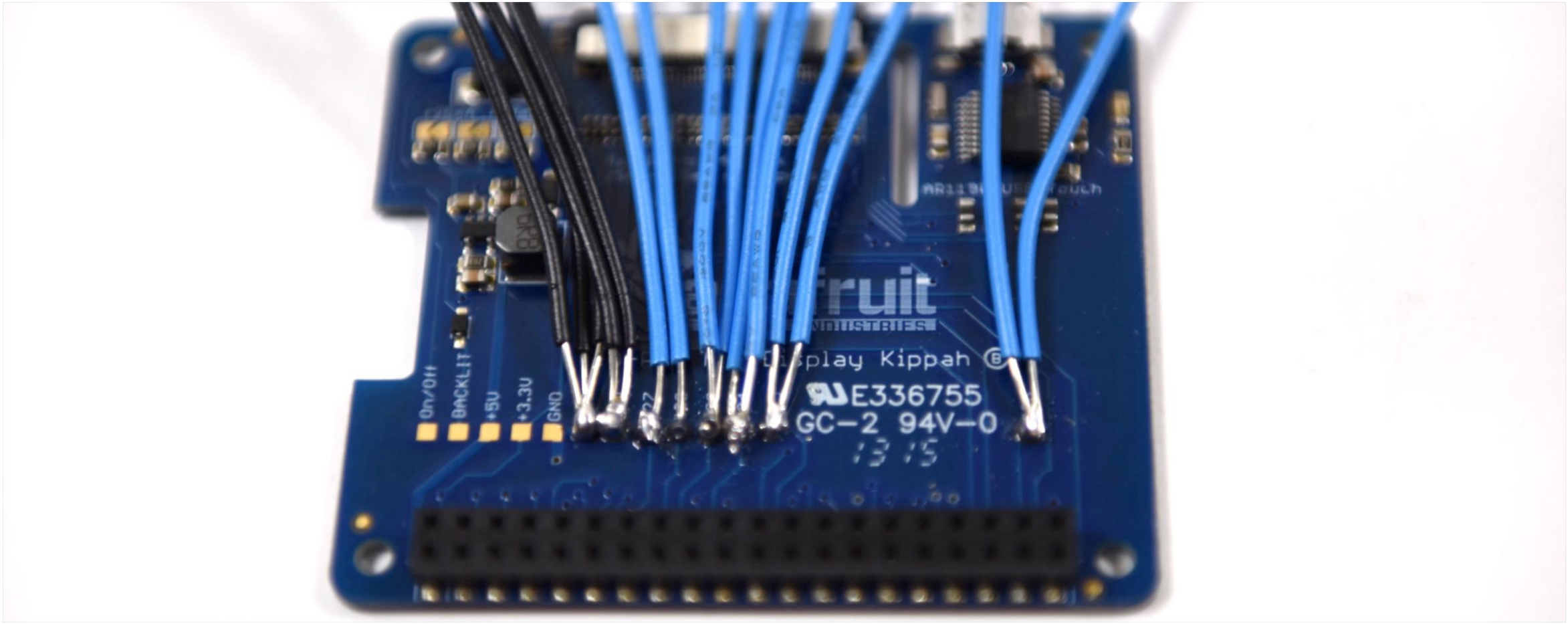
Button Layout

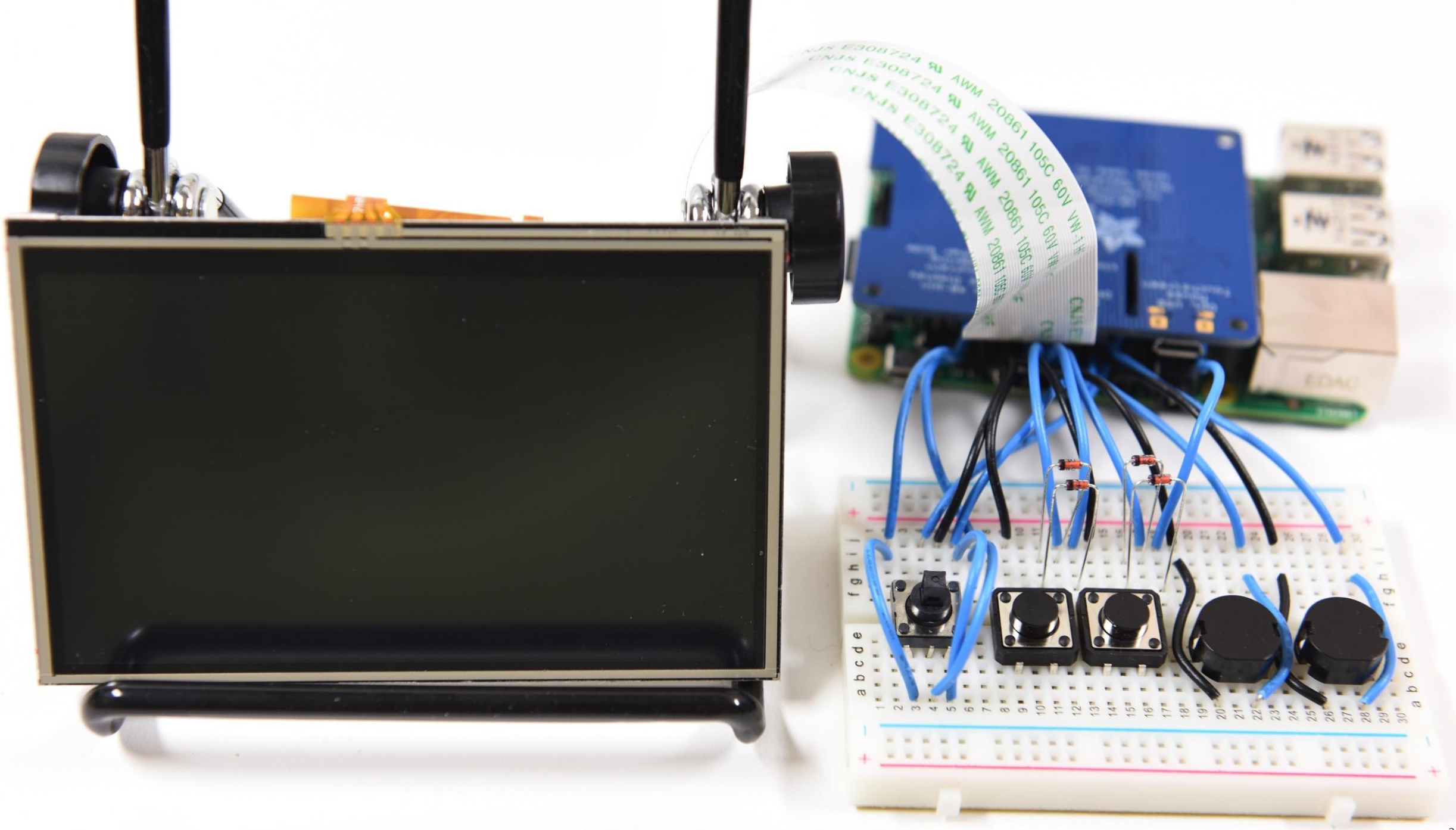


Soldering to the Kippah



All Wires Connected

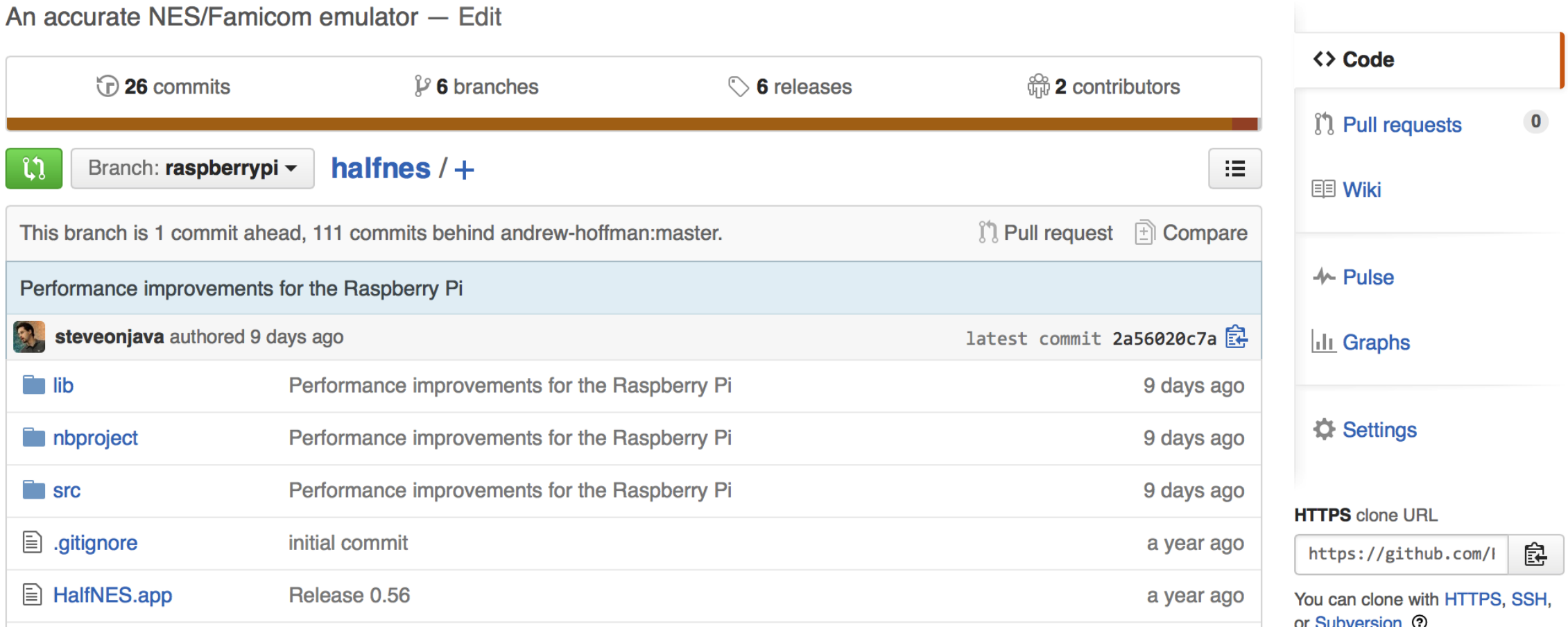



E308724 AWM 20861 105C 60V VW-1
E308724 AWM 20861 105C 60V VW-1
E308724 AWM 20861 105C 60V VW-1
E308724 AWM 20861 105C 60V VW-1
abcde
fghij
fghij
abcde

Java HalfNes Emulator

HalfNes Project

https://github.com/andrew-hoffman/halfnes



Steps

1. Select platform type
2. **Set Up Remote Platform**

Set Up Remote Platform

Platform Name: Raspberry Pi

Host: nighthackingpi.local Port: 22

Username: pi

(•) Use Password Authentication

Password: ••••••••

( ) Use Key Authentication

Key File: Browse...

Key Passphrase:

Remote JRE Path: -oracle-arm-vfp-hflt/ Create...

Working Dir: /home/pi/NetBeansPrc

Project Properties - halfnes

Categories:

- Sources
- Libraries
- Build
  - Compiling
  - Packaging
  - Deployment
  - Documenting
- Run
- Application
  - Web Start
- License Headers
- Formatting
- Hints

Configuration: Raspberry Pi [New...] [Delete]

Runtime Platform: Gluon JavaFX 2 [Manage Platforms...]

Main Class: com.grapeshot.halfnes.JavaFXNES [Browse...]

Arguments: /home/pi/ROMs/LoveStory.zip

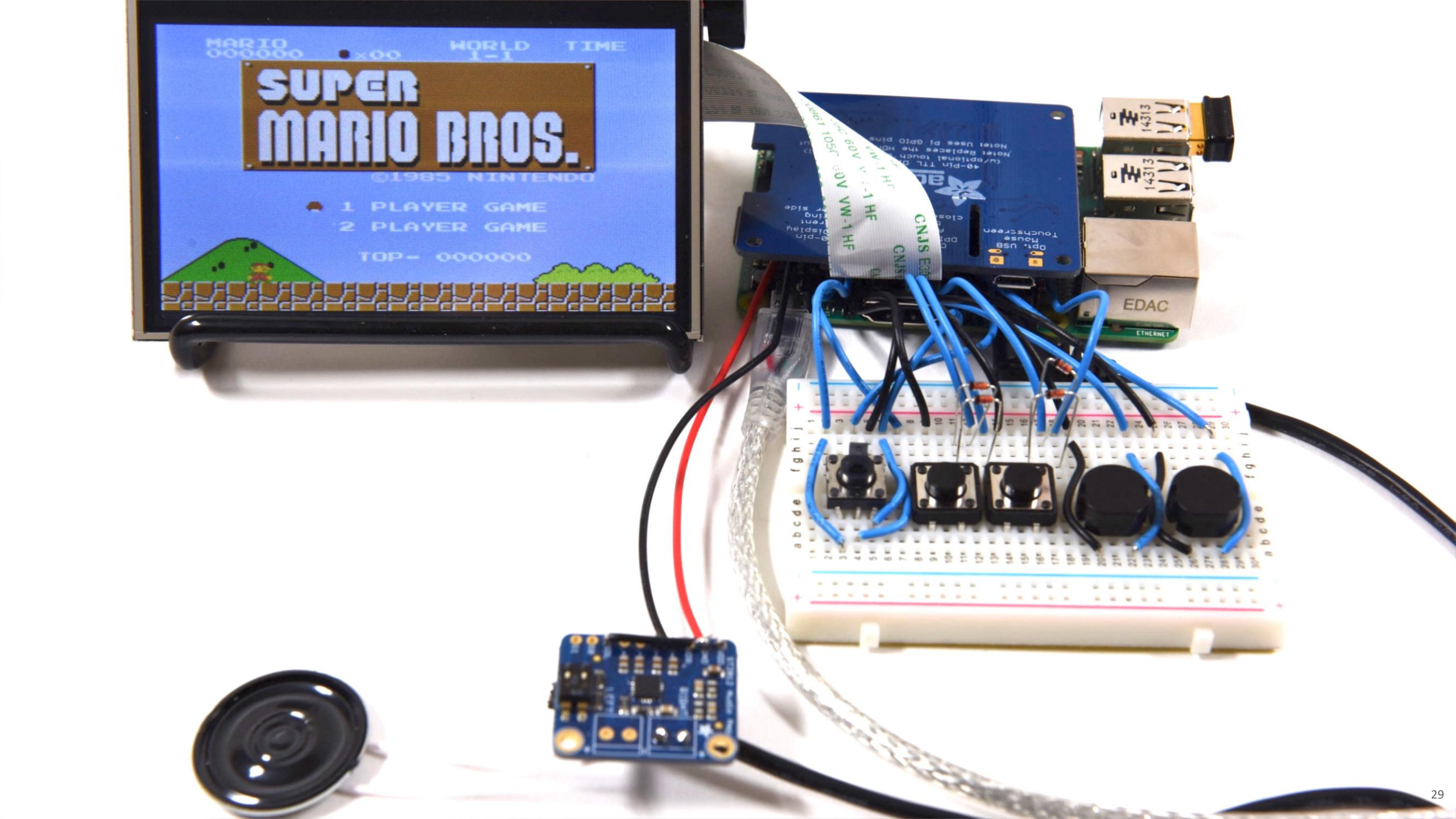
Working Directory: [Browse...]

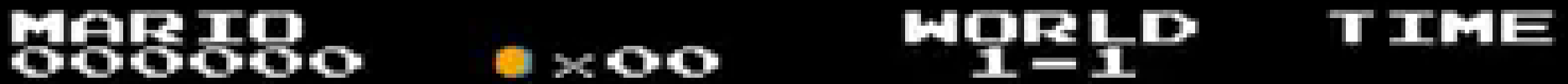
VM Options: -Djava.library.path=/usr/lib/jni -Xms256m [Customize]

(e.g. -Xms10m)

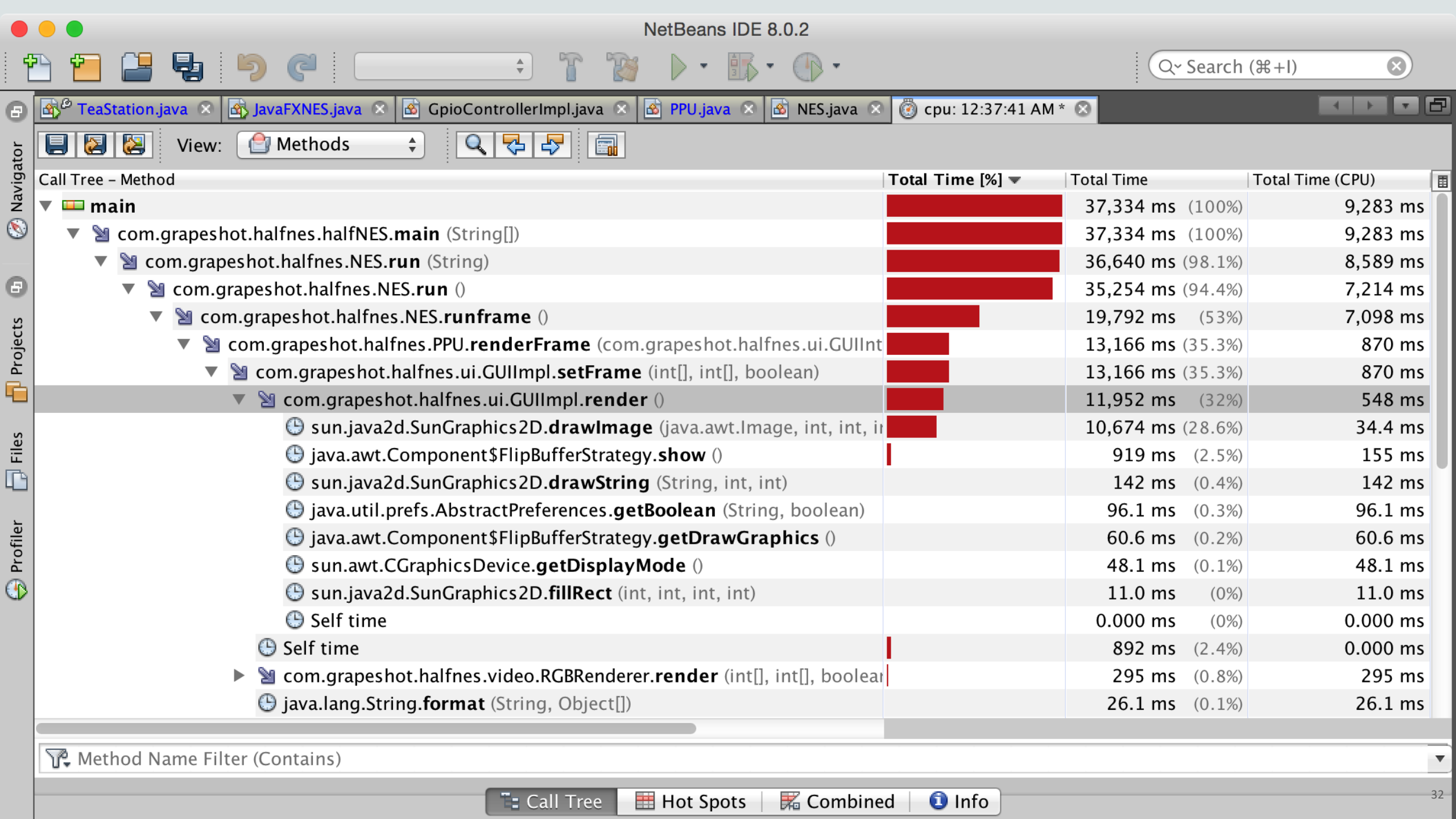
☑ Run with Java Web Start

(To run and debug the application with Java Web Start, first enable Java Web Start)


MARIO
WORLD
TIME
SUPER
MARIO BROS.
©1985 NINTENDO
1 PLAYER GAME
2 PLAYER GAME
TOP- 000000
EDAC
ETHERNET



TIME UP


NetBeans IDE 8.0.2
Search (⌘+I)
TeaStation.java
JavaFXNES.java
GpioControllerImpl.java
PPU.java
NES.java
cpu: 12:37:41 AM *
View:
Methods
Call Tree – Method
Total Time [%]
Total Time
Total Time (CPU)
main 37,334 ms (100%) 9,283 ms
com.grapeshot.halfnes.halfNES.main (String[]) 37,334 ms (100%) 9,283 ms
com.grapeshot.halfnes.NES.run (String) 36,640 ms (98.1%) 8,589 ms
com.grapeshot.halfnes.NES.run () 35,254 ms (94.4%) 7,214 ms
com.grapeshot.halfnes.NES.runframe () 19,792 ms (53%) 7,098 ms
com.grapeshot.halfnes.PPU.renderFrame (com.grapeshot.halfnes.ui.GUIInt 13,166 ms (35.3%) 870 ms
com.grapeshot.halfnes.ui.GUIImpl.setFrame (int[], int[], boolean) 13,166 ms (35.3%) 870 ms
com.grapeshot.halfnes.ui.GUIImpl.render () 11,952 ms (32%) 548 ms
sun.java2d.SunGraphics2D.drawImage (java.awt.Image, int, int, i 10,674 ms (28.6%) 34.4 ms
java.awt.Component$FlipBufferStrategy.show () 919 ms (2.5%) 155 ms
sun.java2d.SunGraphics2D.drawString (String, int, int) 142 ms (0.4%) 142 ms
java.util.prefs.AbstractPreferences.getBoolean (String, boolean) 96.1 ms (0.3%) 96.1 ms
java.awt.Component$FlipBufferStrategy.getDrawGraphics () 60.6 ms (0.2%) 60.6 ms
sun.awt.CGraphicsDevice.getDisplayMode () 48.1 ms (0.1%) 48.1 ms
sun.java2d.SunGraphics2D.fillRect (int, int, int, int) 11.0 ms (0%) 11.0 ms
Self time 0.000 ms (0%) 0.000 ms
Self time 892 ms (2.4%) 0.000 ms
com.grapeshot.halfnes.video.RGBRenderer.render (int[], int[], boolear 295 ms (0.8%) 295 ms
java.lang.String.format (String, Object[]) 26.1 ms (0.1%) 26.1 ms
Method Name Filter (Contains)
Call Tree
Hot Spots
Combined
Info
Navigator
Projects
Files
Profiler

Which Are the Real Performance Bottlenecks?

- Swing Video via X-Windows
- Synchronization between CPU, PPU, APU
  - Return to per-line instead of per-pixel
- Bitwise Helper Functions
- Extracting PPU Operations
- Replace APU Double Math with Longs
- Array Access via Unsafe
- Replace loops with System.arraycopy
- PWM Audio

HalfNes Performance Bottlenecks

- Swing Video via X-Windows
- Synchronization between CPU, PPU, APU
  - Return to per-line instead of per-pixel
- Bitwise Helper Functions
- Extracting PPU Operations
- Replace APU Double Math with Longs
- ~~Array Access via Unsafe~~ (Doesn't actually help)
- Replace loops with System.arraycopy
- PWM Audio

3D Printing a Case

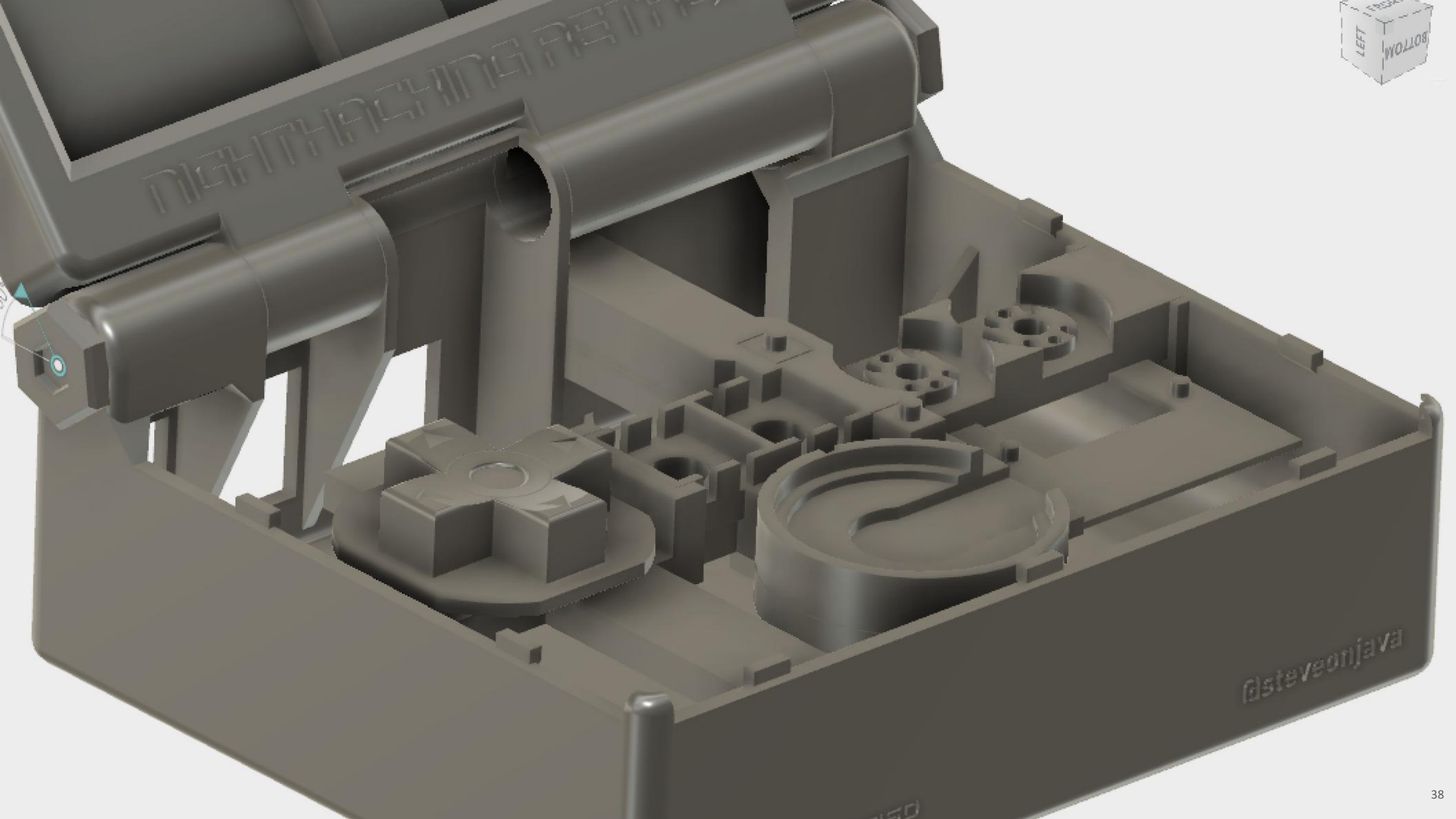
http://vidal-design.deviantart.com/art/Mario-Versus-Bullet-Bill-3D-printed-402524749

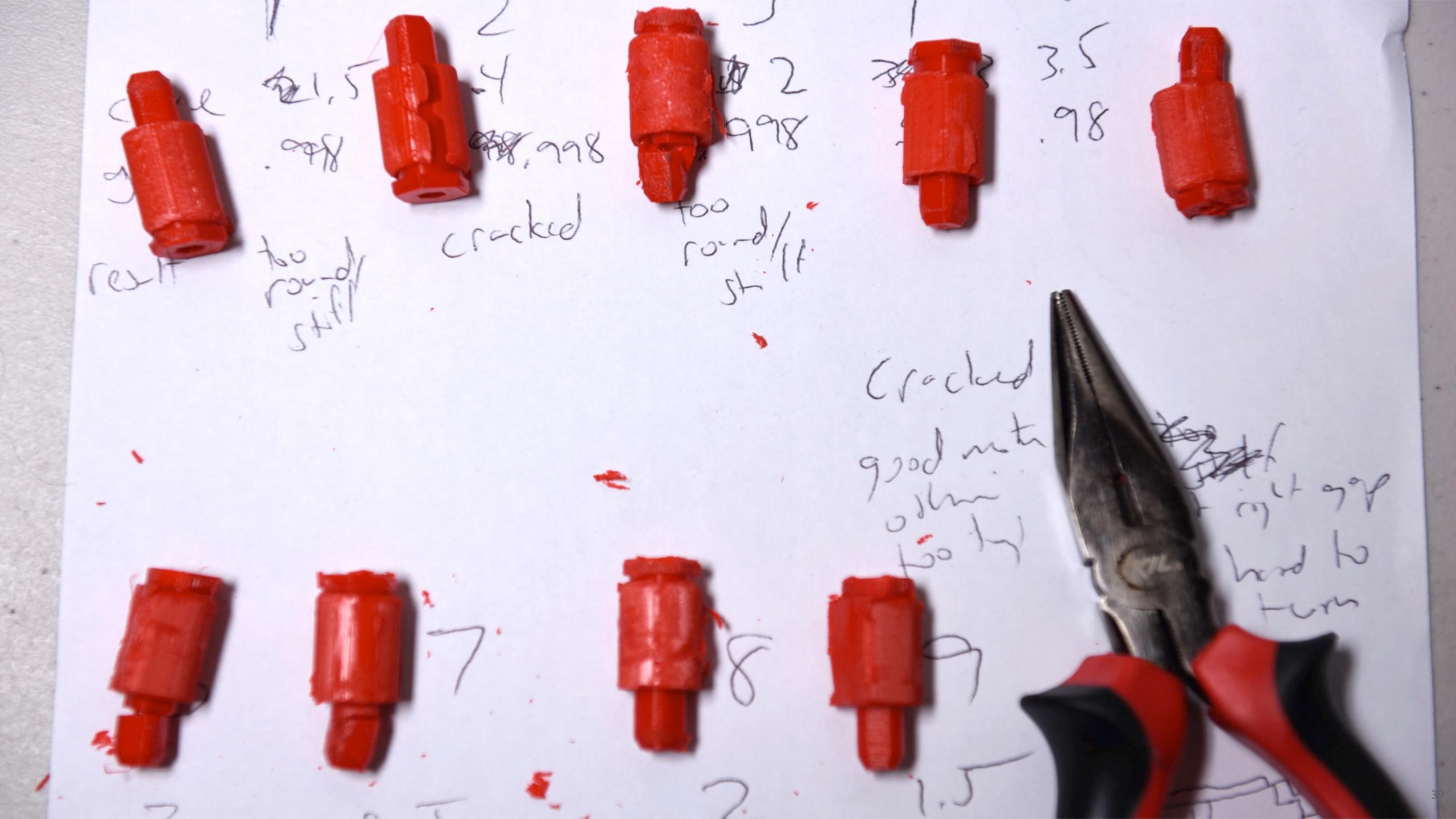
Ultimaker 2

MODEL ▾ | CREATE ▾ | MODIFY ▾ | ASSEMBLE ▾ | SKETCH ▾ | CONSTRUCT ▾ | INSPECT ▾ | INSERT ▾ | MAKE ▾ | SELECT ▾ | POSITION ▾

BROWSER

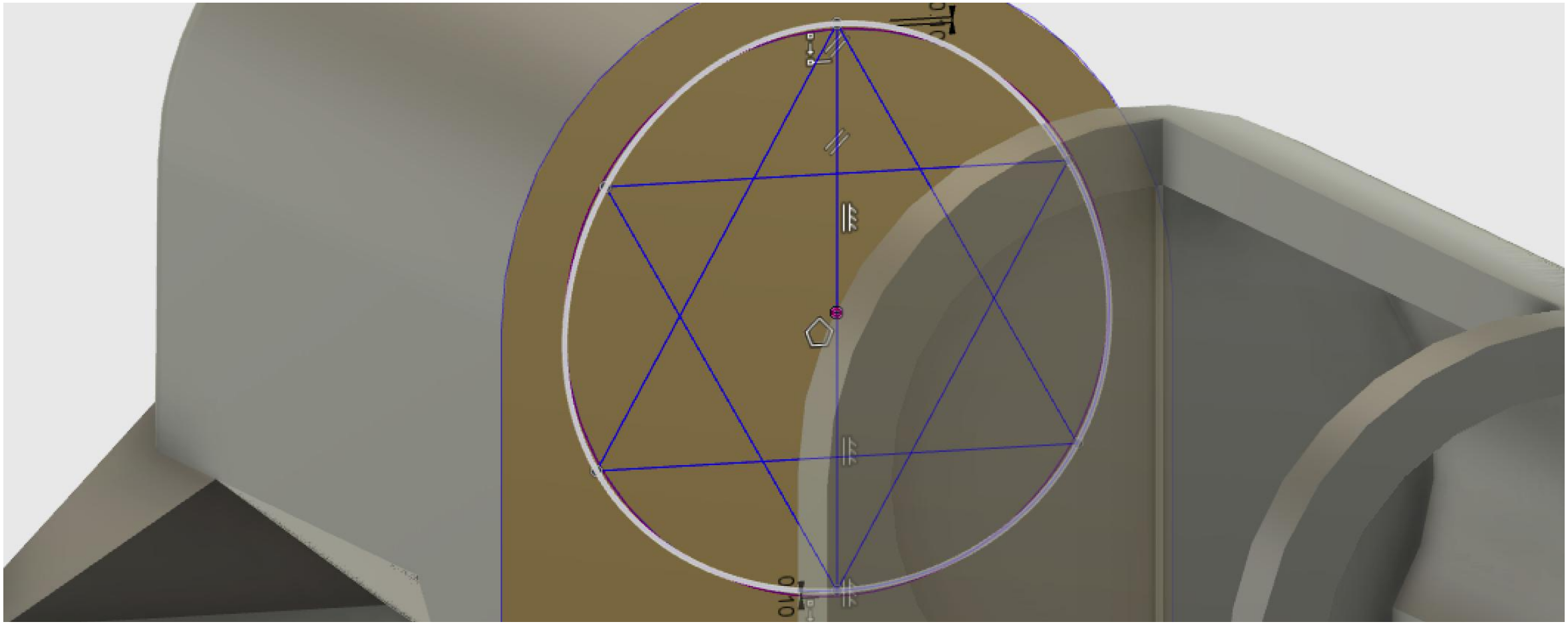
- RetroPi Case v236
  - Named Views
  - Units: mm
  - Origin
  - Joints
  - Decals
  - Sketches
  - Construction
  - Console:1
    - Origin
    - Bodies
      - Base
      - Lid
      - Button Holder
      - D-Pad Holder
      - D-Pad
  - Screen:1
    - Origin
    - Joints
    - Bodies
    - Left Plug:1
    - Right Plug:1

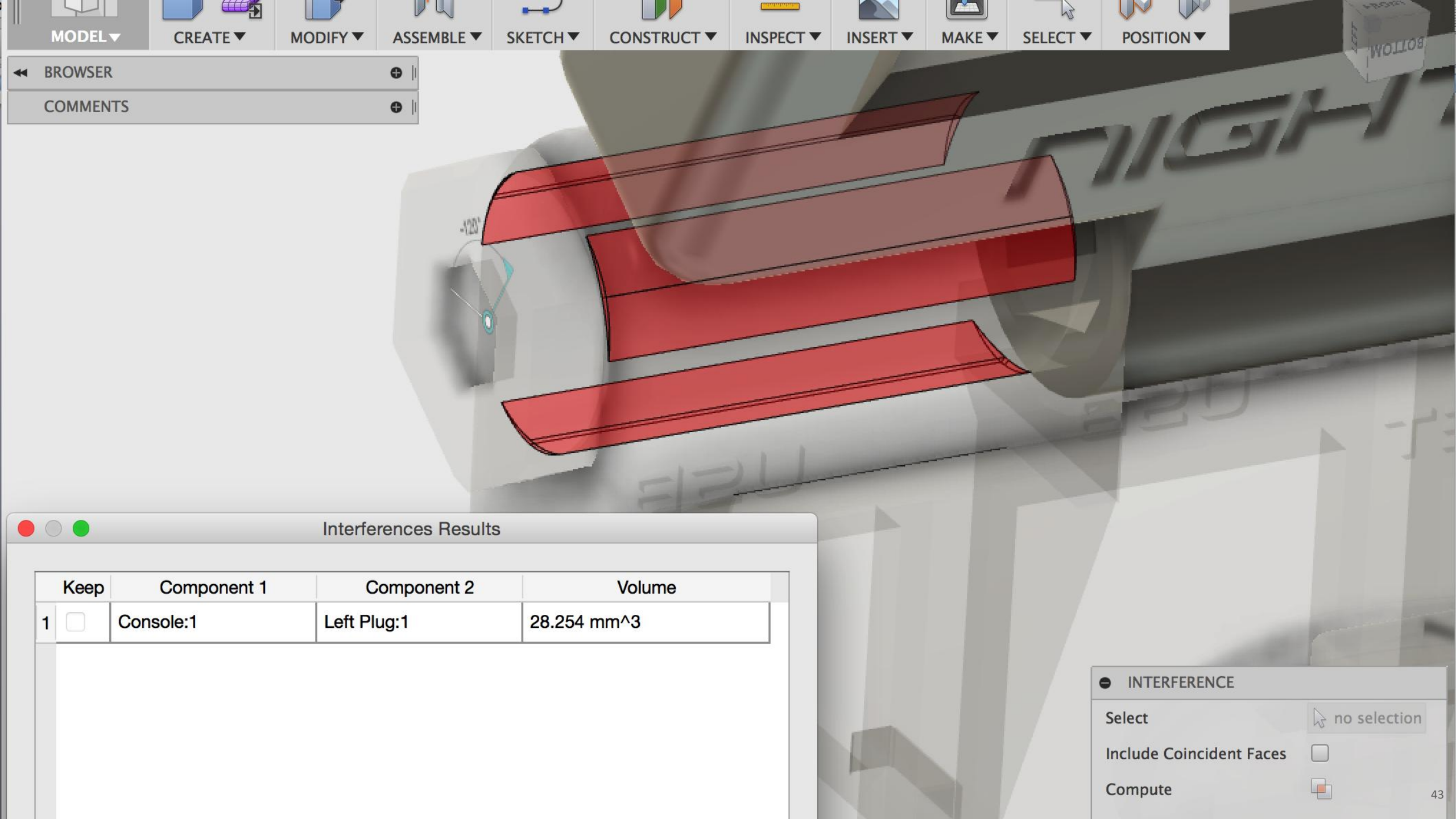

@steveonjava


1.5
.998
.998
cracked
too round/ stiff
too round/ stiff
2
.998
3.5
.98
too round/ stiff
Cracked
good with other tool
too tight
hard to turn
7
8
9
2
1.5


MAGIC-1
LIFE-1
NEXT
0000/0050

Hinge Design




MODEL
CREATE
MODIFY
ASSEMBLE
SKETCH
CONSTRUCT
INSPECT
INSERT
MAKE
SELECT
POSITION
BROWSER
COMMENTS
Interferences Results
Keep
Component 1
Component 2
Volume
1
Console:1
Left Plug:1
28.254 mm^3
INTERFERENCE
Select
no selection
Include Coincident Faces
Compute

Basic | Advanced | Plugins

Quality

Layer height (mm)	0.1
Shell thickness (mm)	.8
Enable retraction	☑ ...

Fill

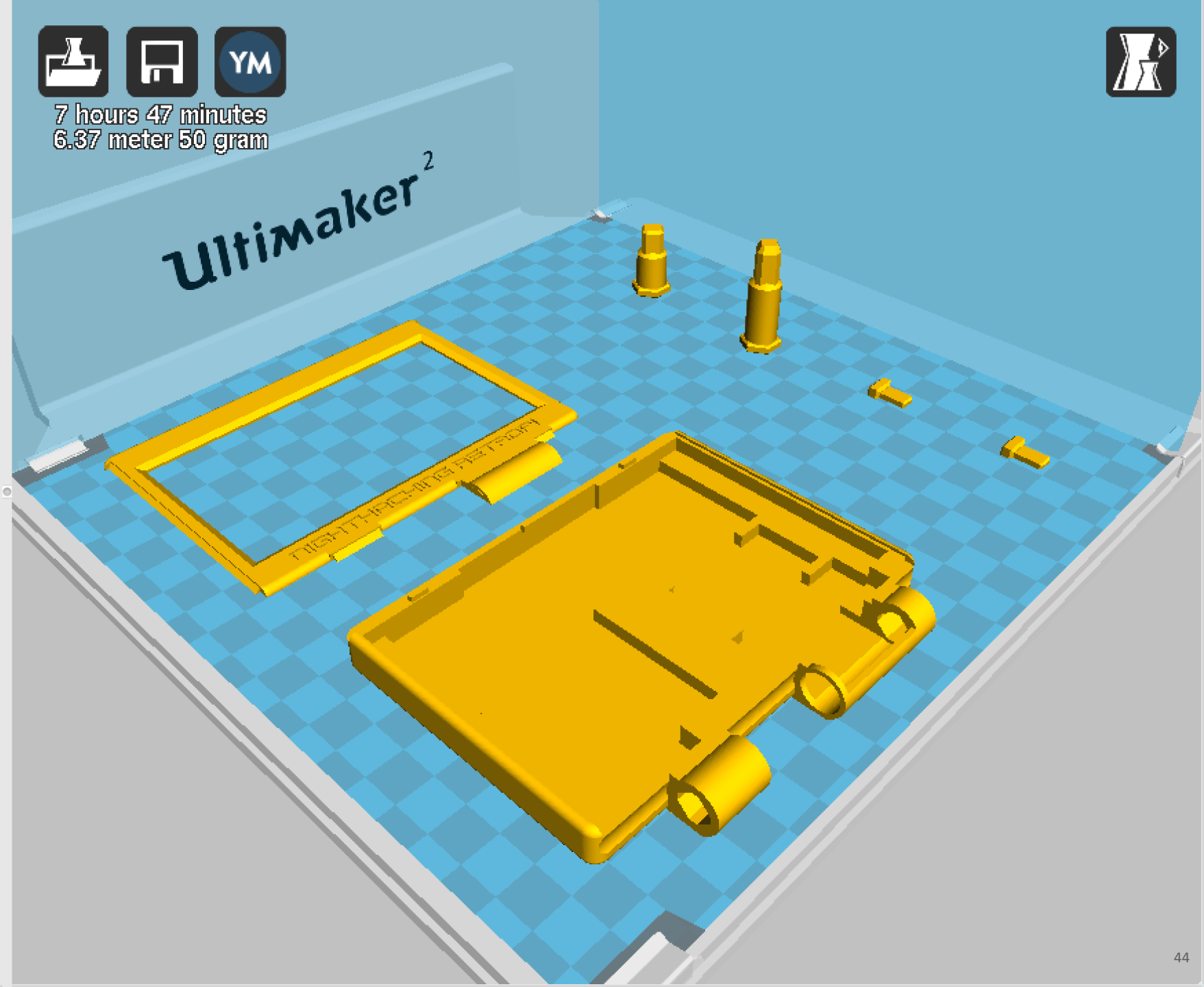
Bottom/Top thickness (mm)	.8
Fill Density (%)	80 ...

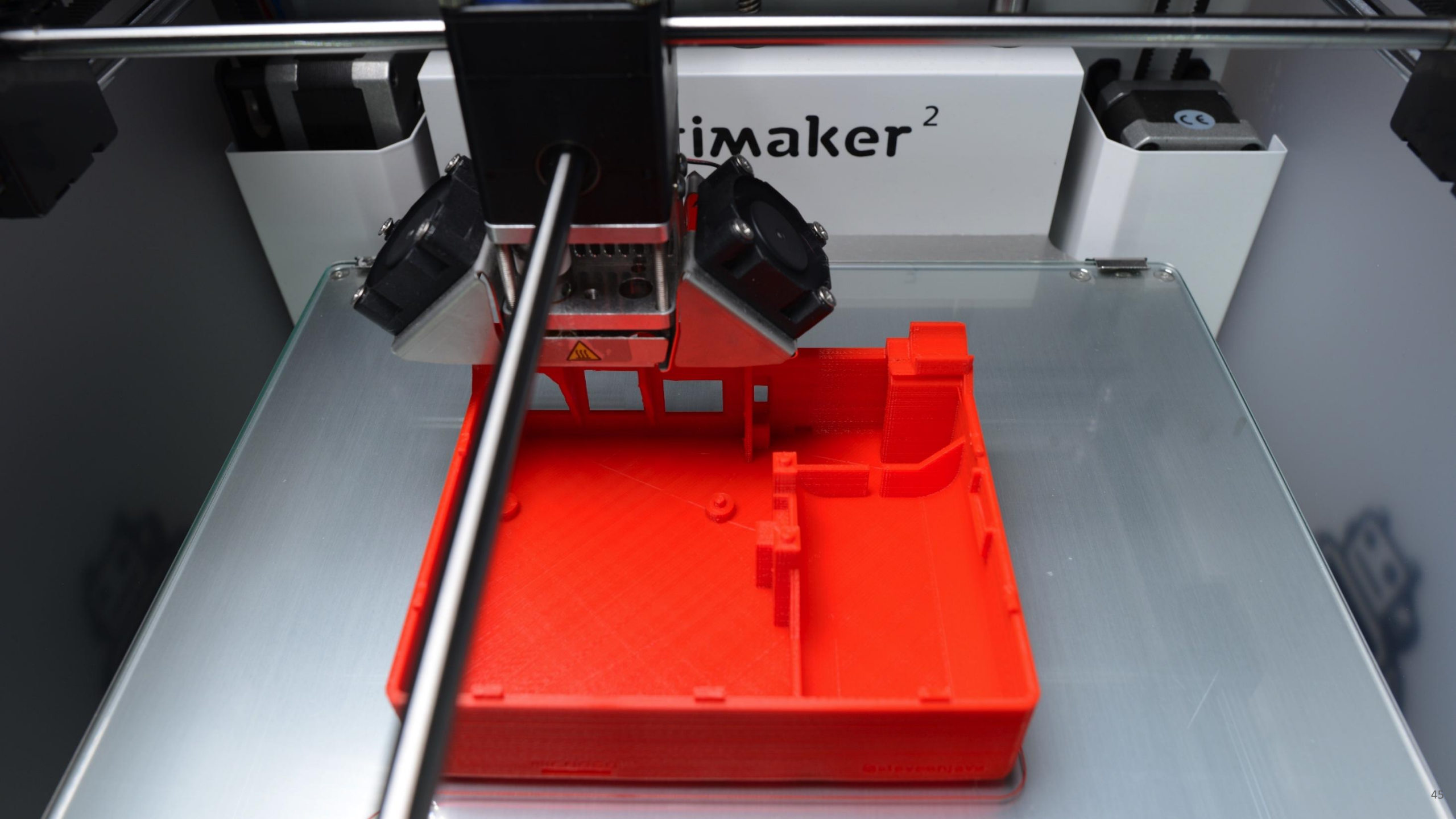
Speed and Temperature

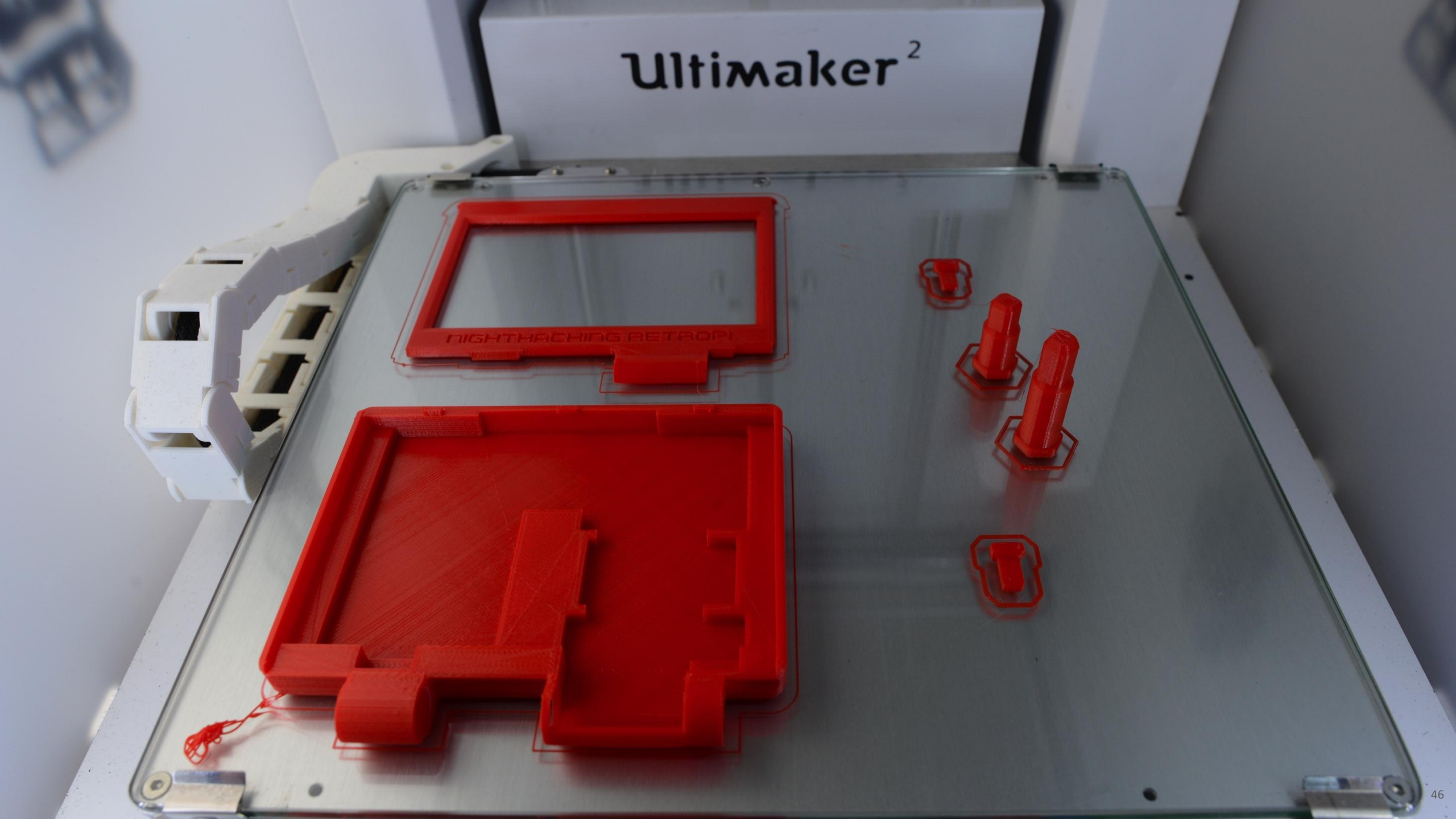
Print speed (mm/s)	50

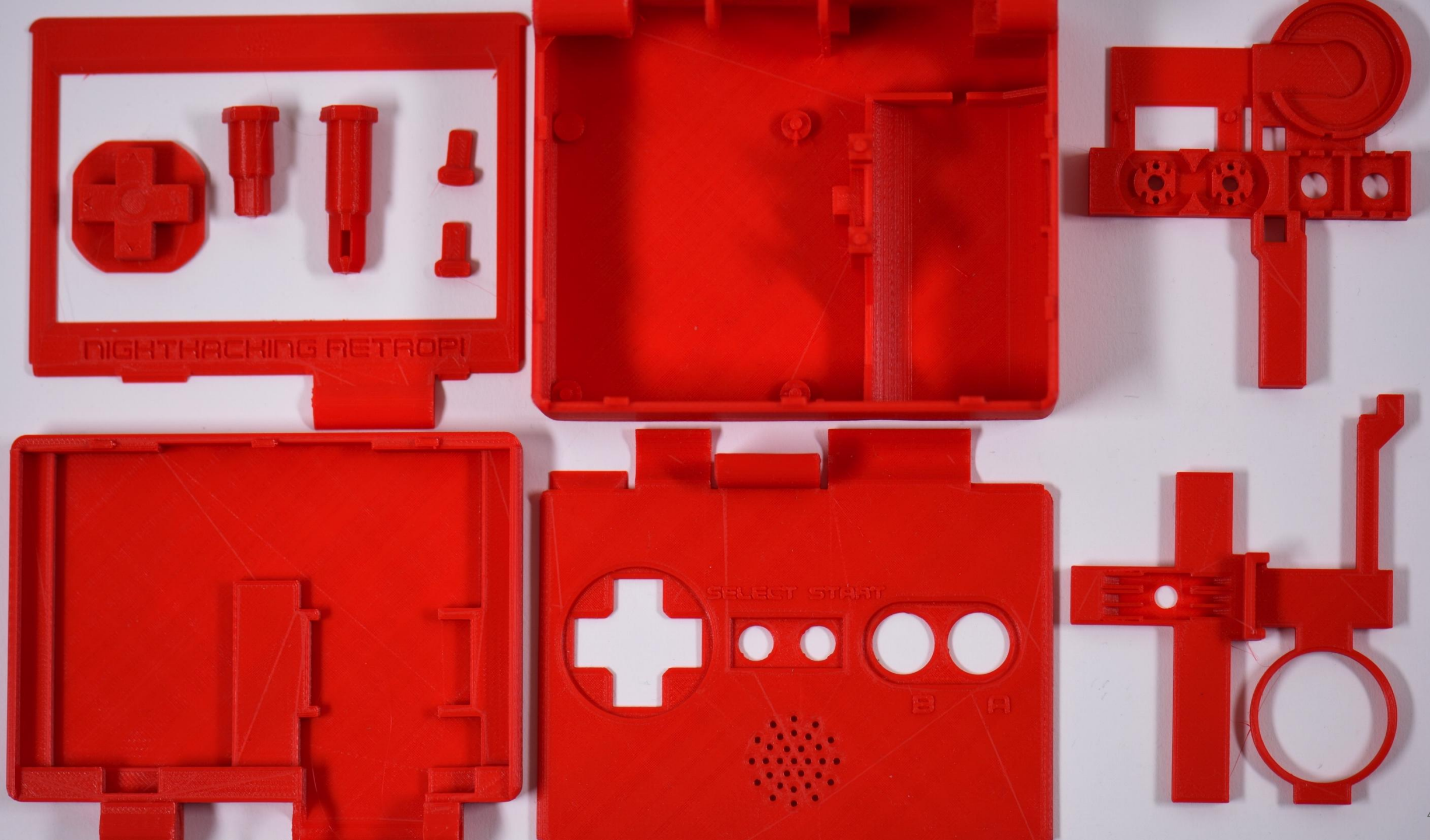
Support

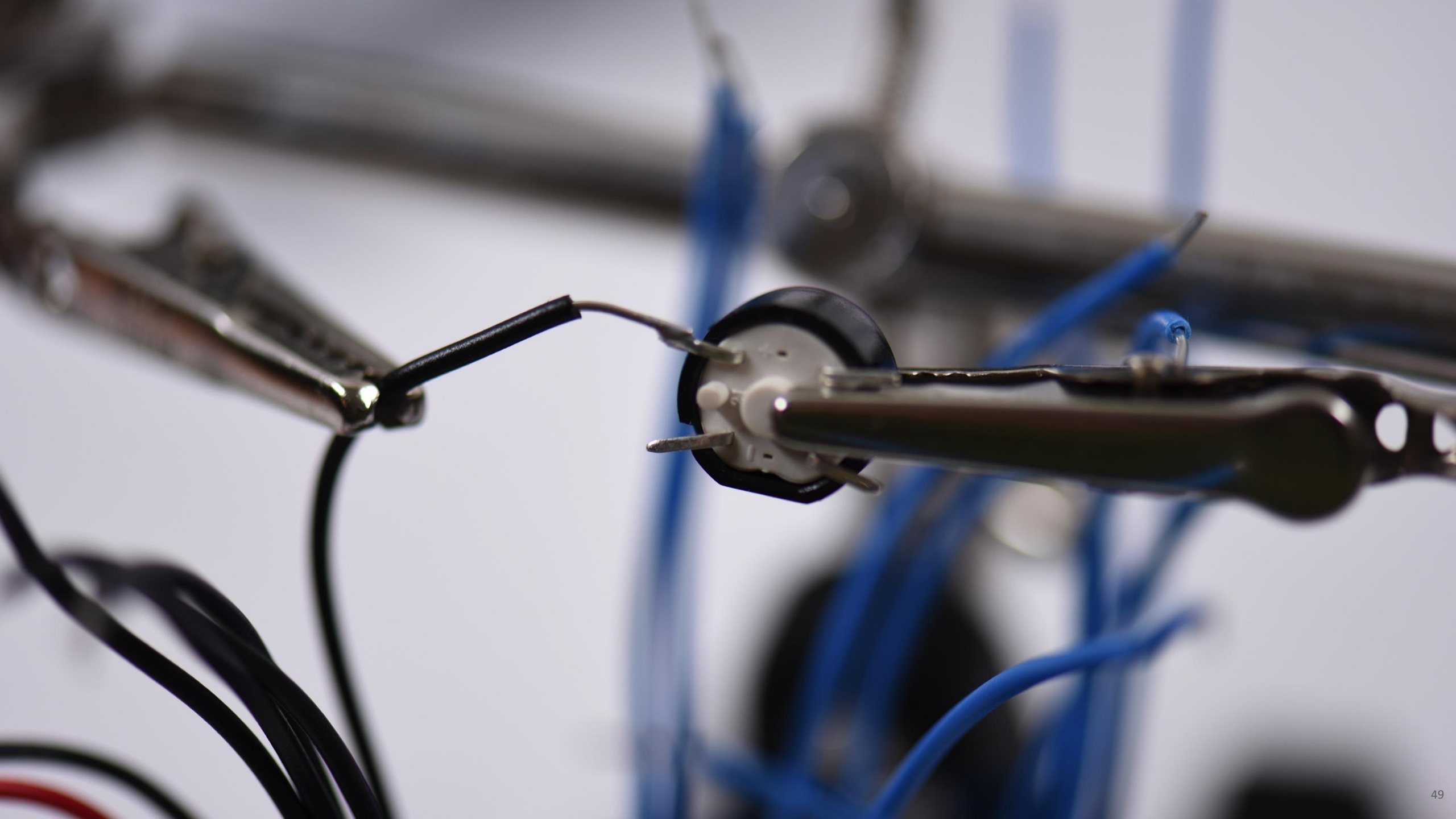
Support type	None ...
Platform adhesion type	None ...

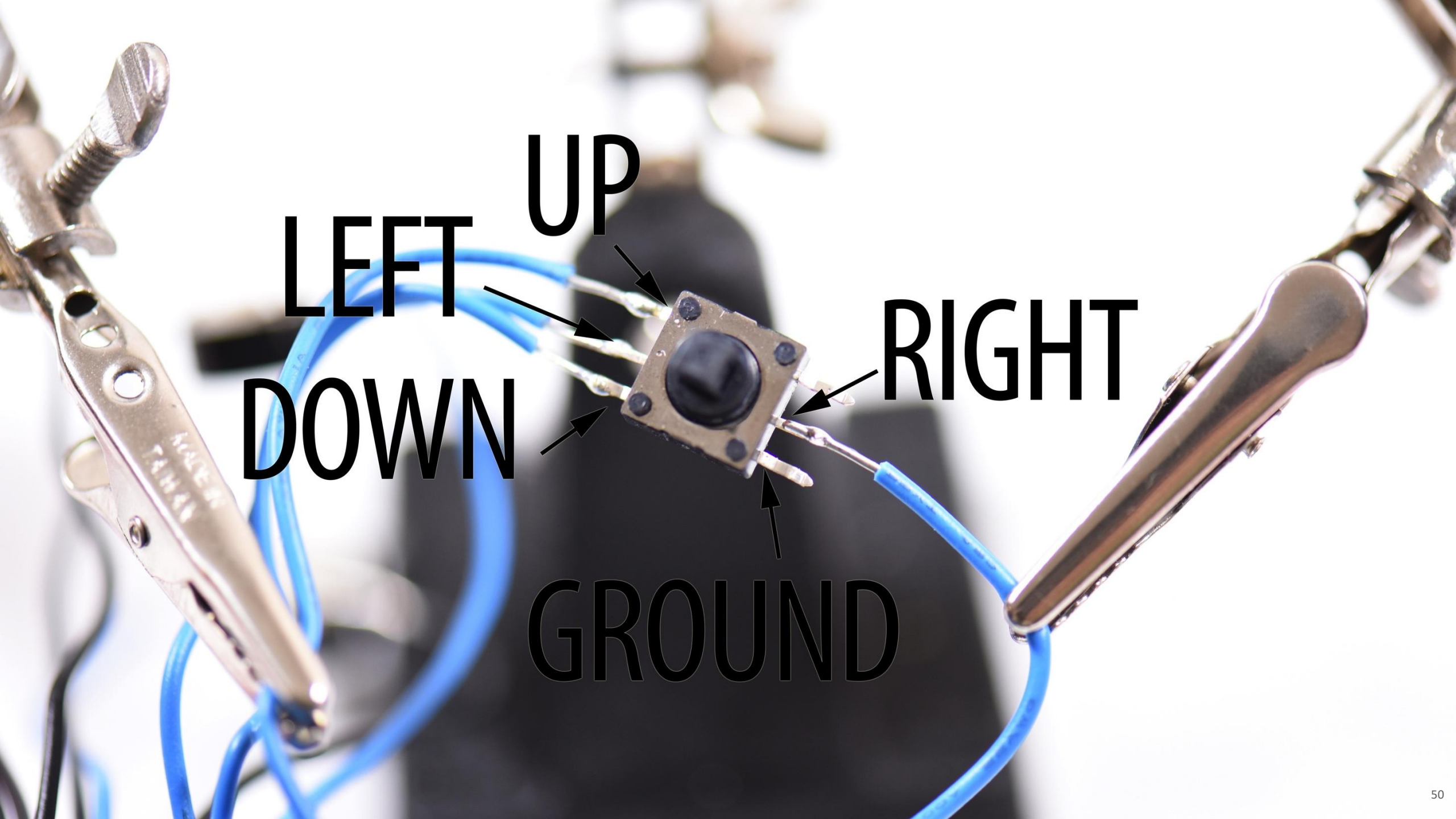



timaker 2


Ultimaker 2
NIGHTHACKING RETROPI

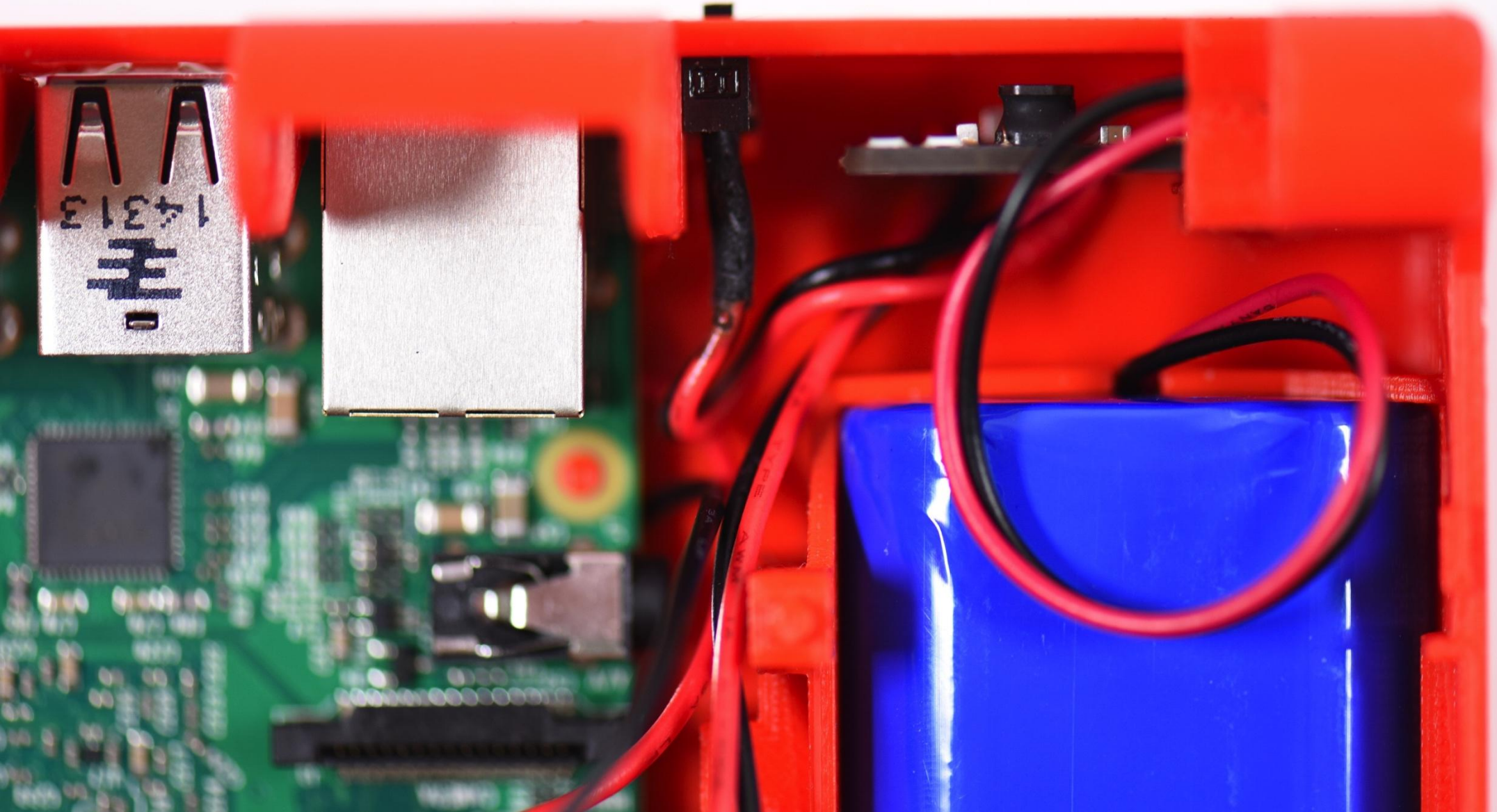

NIGHTHACKING RETROPI
SELECT START
B
A




UP
LEFT
RIGHT
DOWN
GROUND

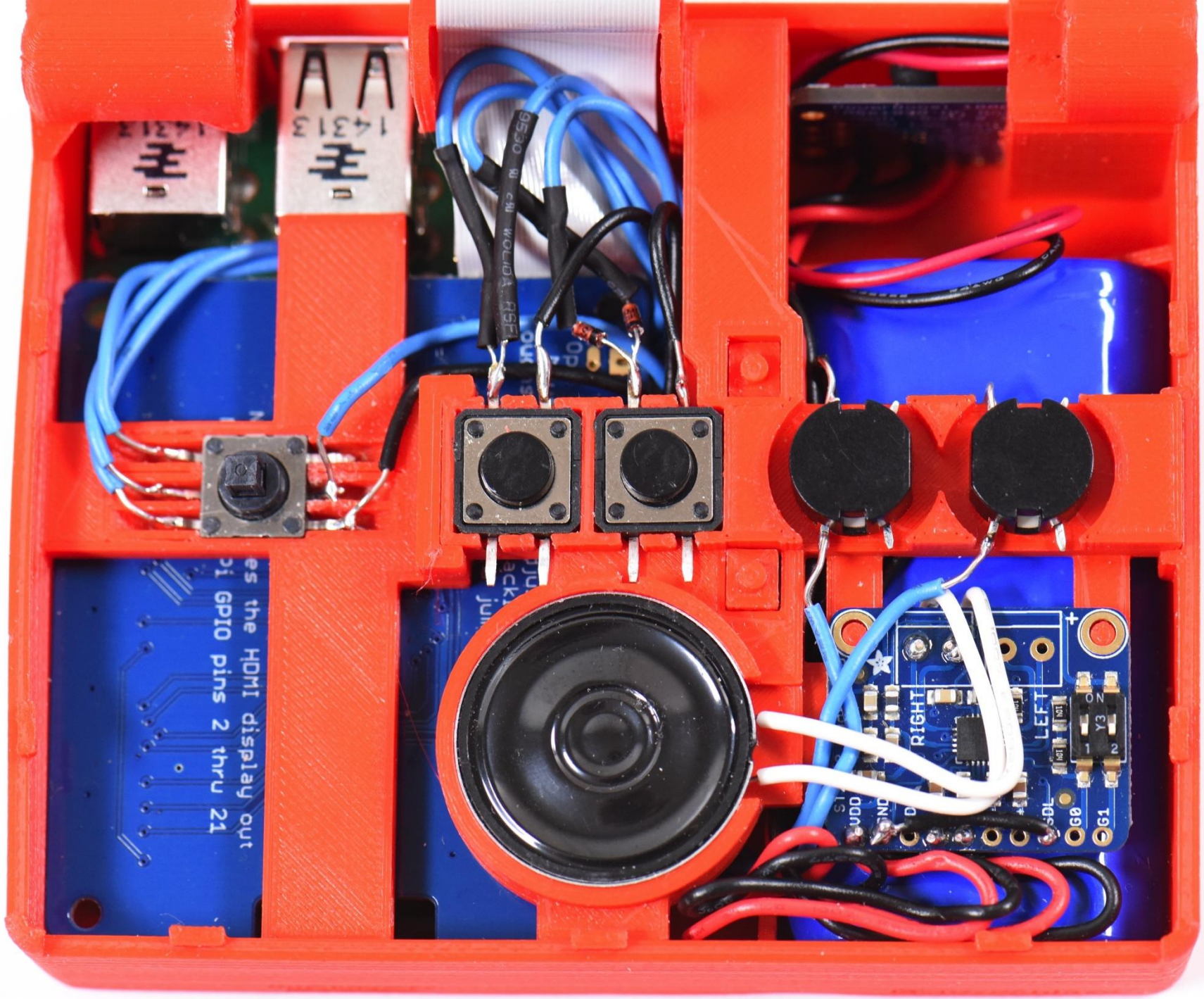
Raspberry Pi 2 Model B V1.1
© Raspberry Pi 2014
BROADCOM
ETHERNET
CAMERA
DISPLAY
HDMI
GPIO

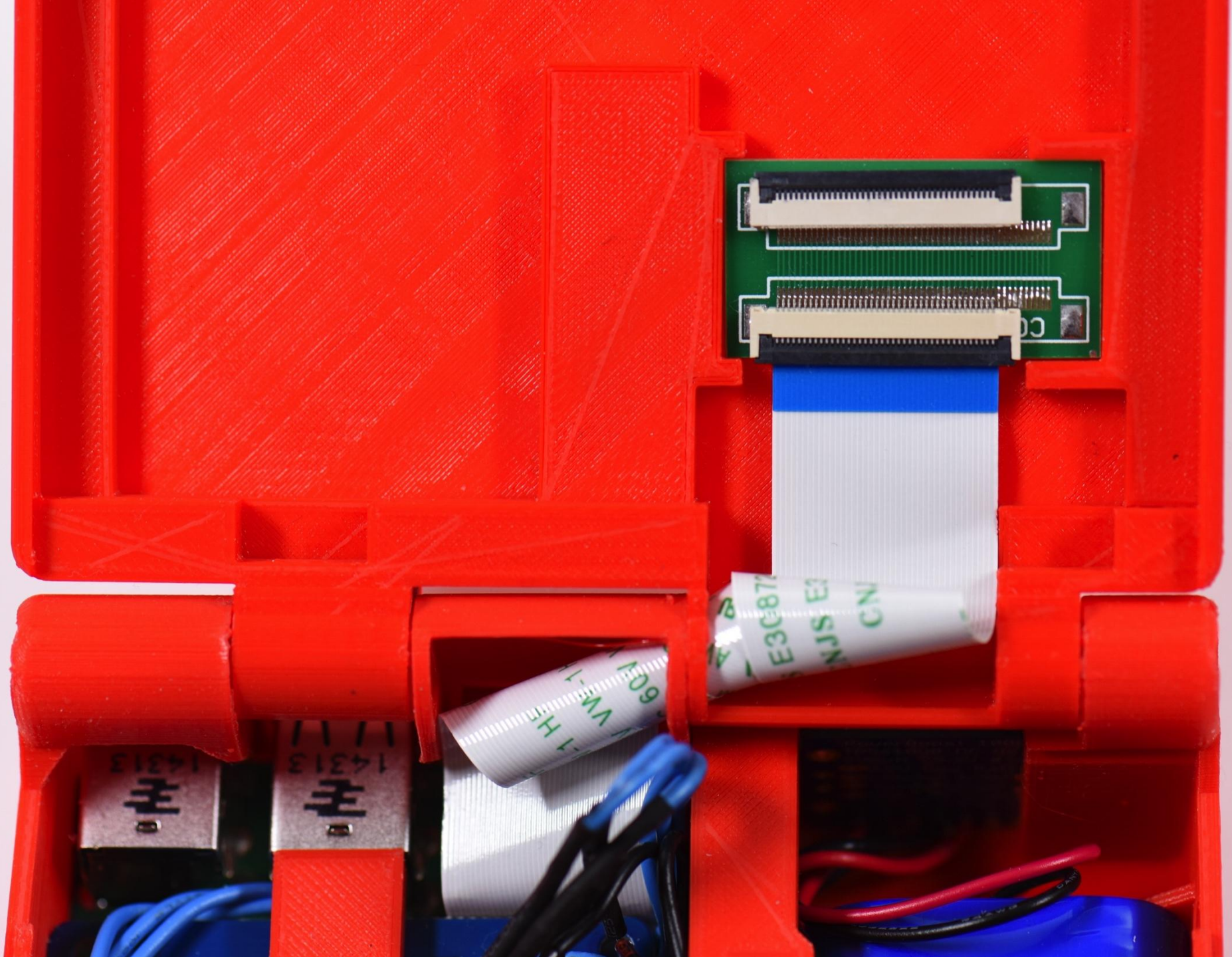
ETHERNET
A/V
CAMERA
HDMI
DISPLAY
PWR
GPIO
RUN
ACT
PWR
Raspberry Pi 2 Model B V1.1
© Raspberry Pi 2014
BROADCOM

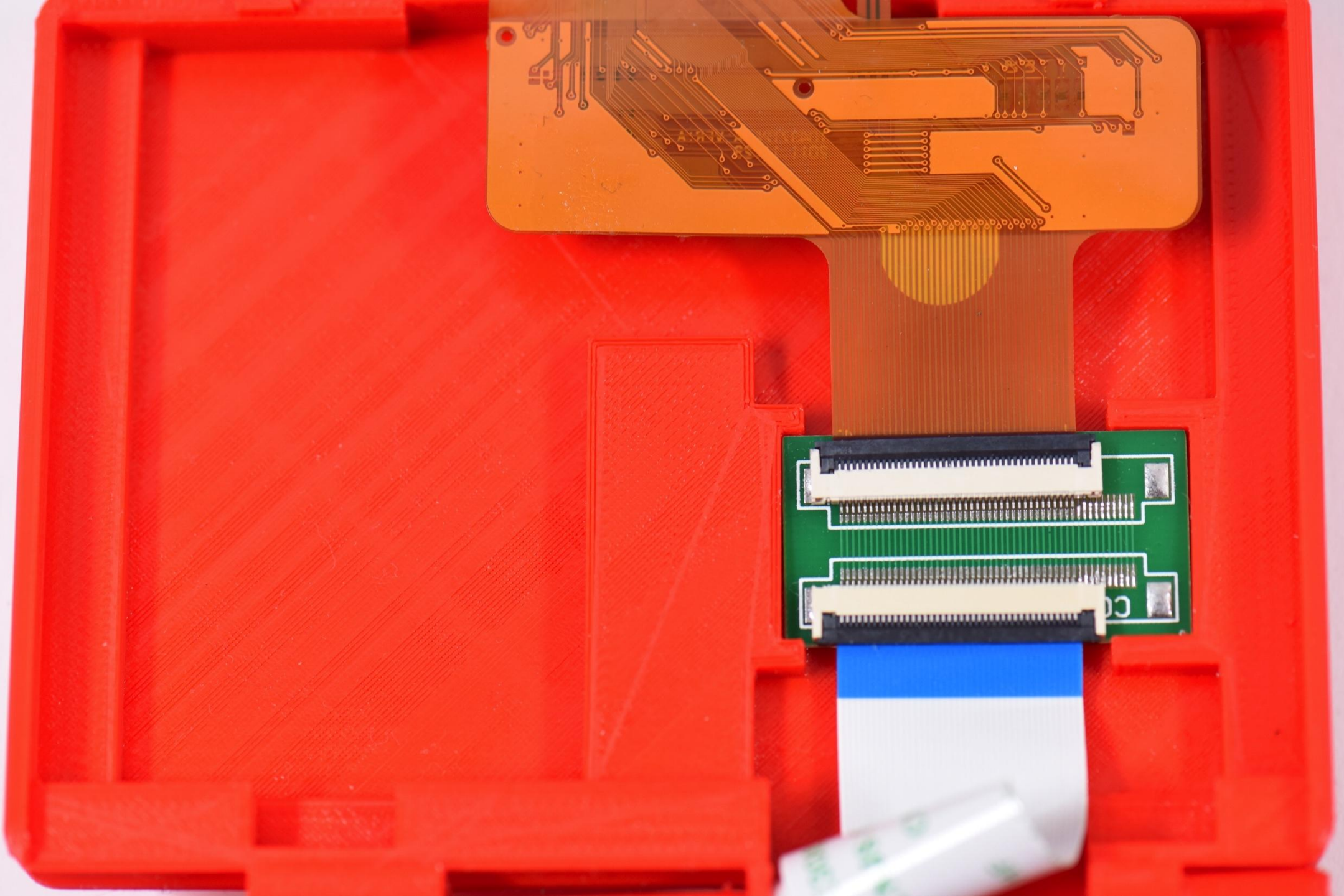


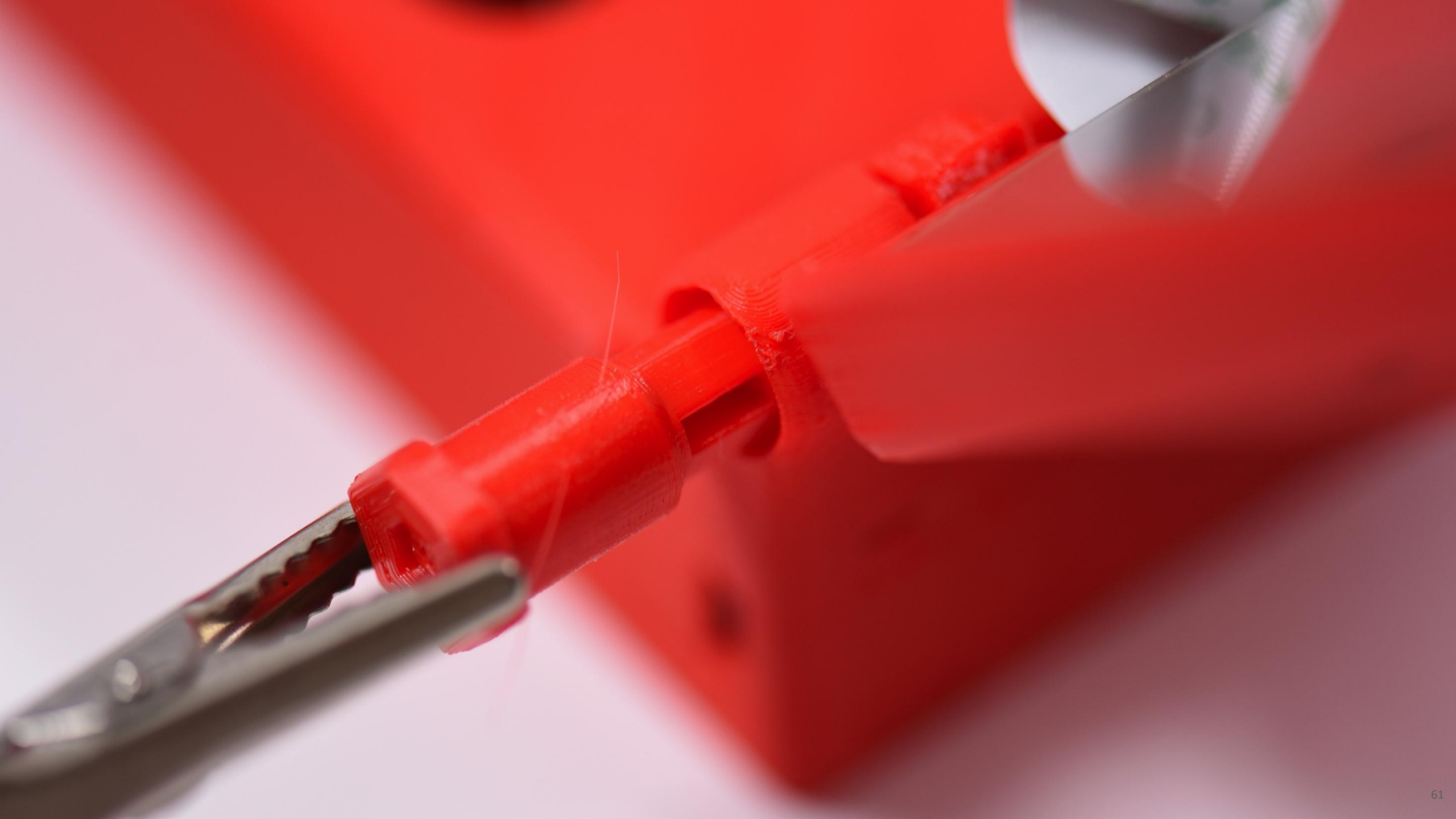
Connect standard 40-pin
DPI / DotClock type Display
Adjust constant-current
backlight by soldering
closed jumpers on other side
adafruit
INDUSTRIES
40-Pin TTL Display Kippah
(w/optional touch screen control)
Note: Replaces the HDMI display out
Note: Uses Pi GPIO pins 2 thru 21

standard 40-pin
Clock type Display
constant-current
by soldering
on other
es the HDMI display out
Pi GPIO pins 2 thru 21

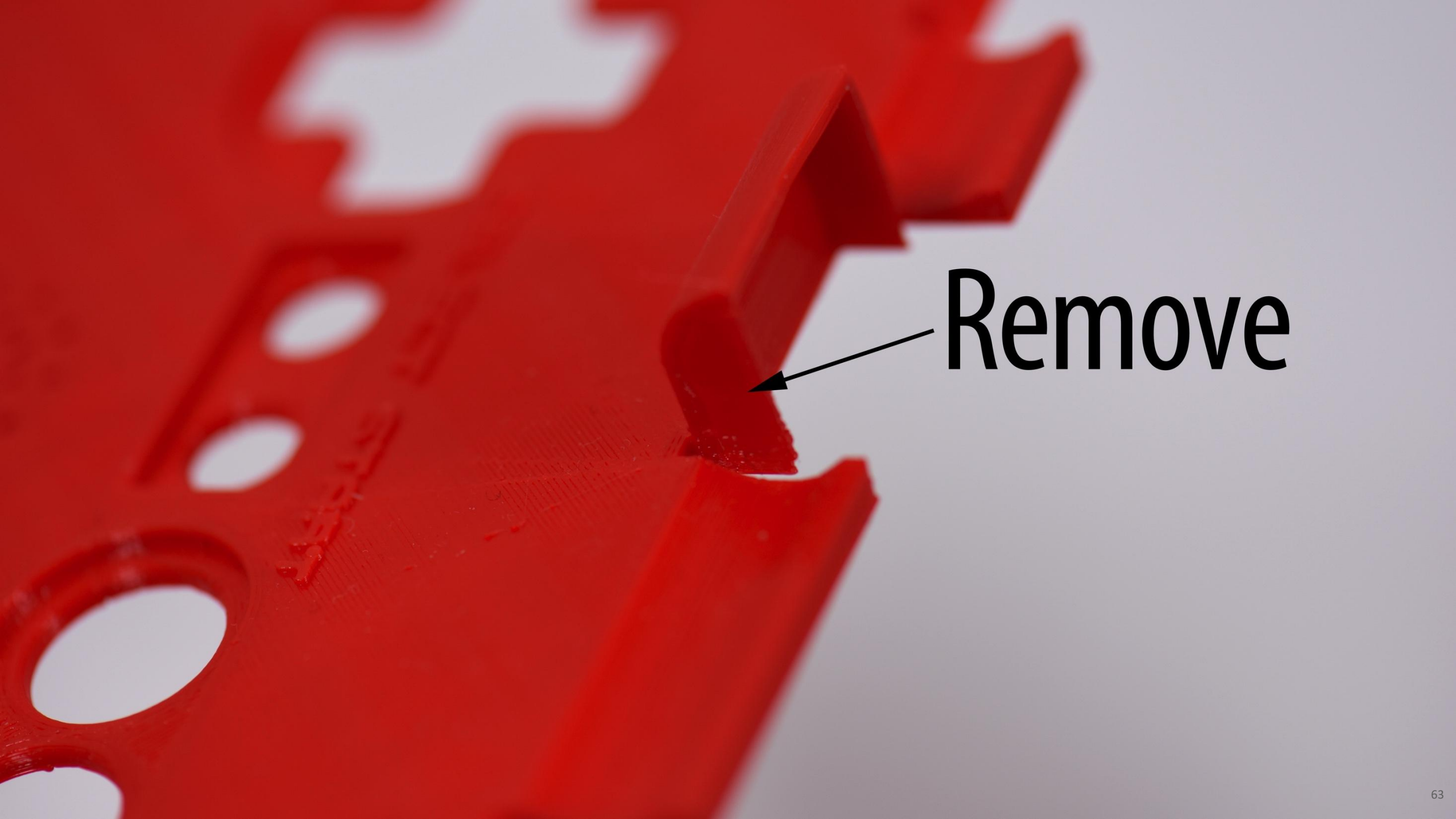

RIGHT
LEFT
ON
Y3
1
2
VDD
SCL
G0
G1

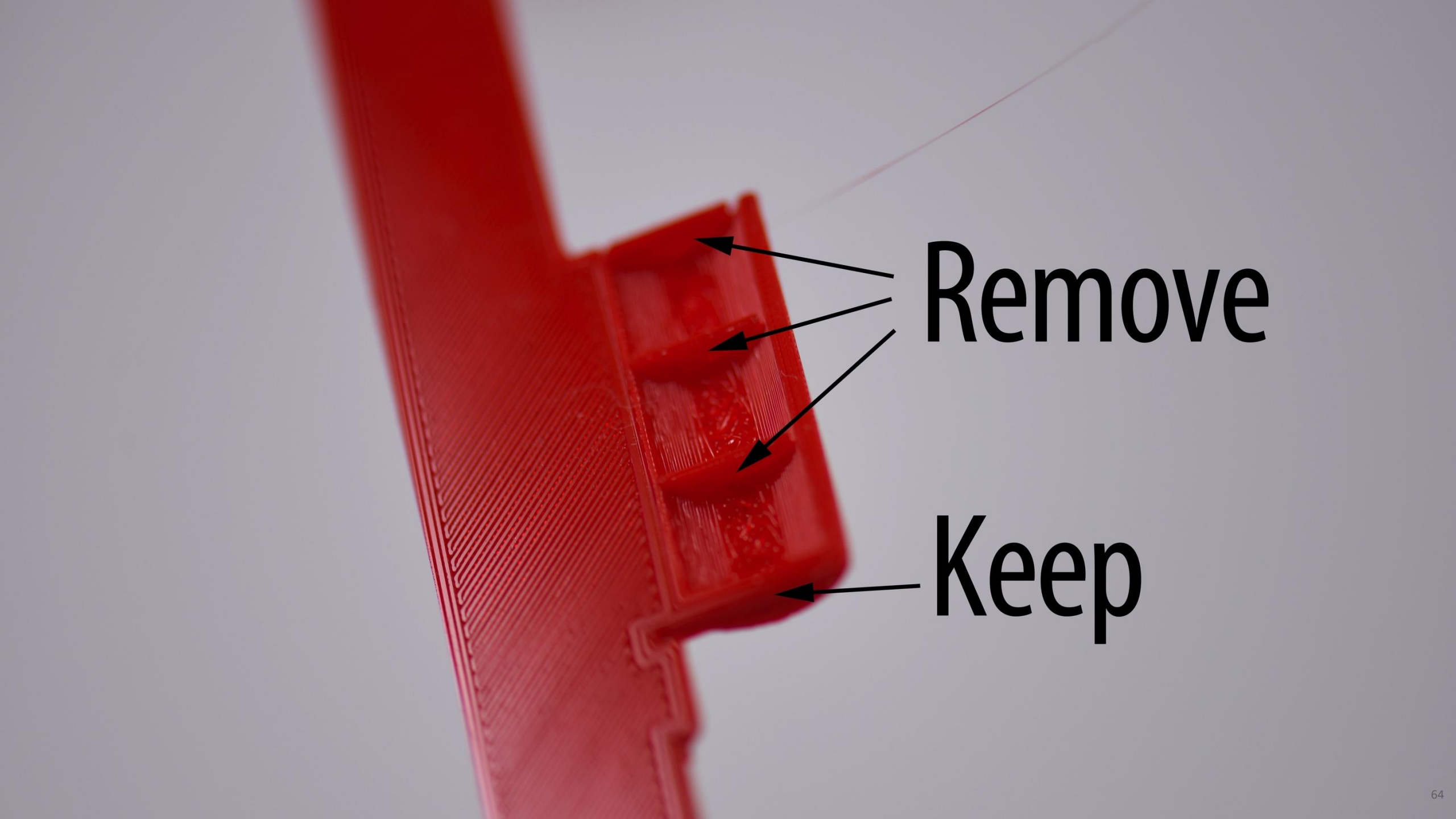






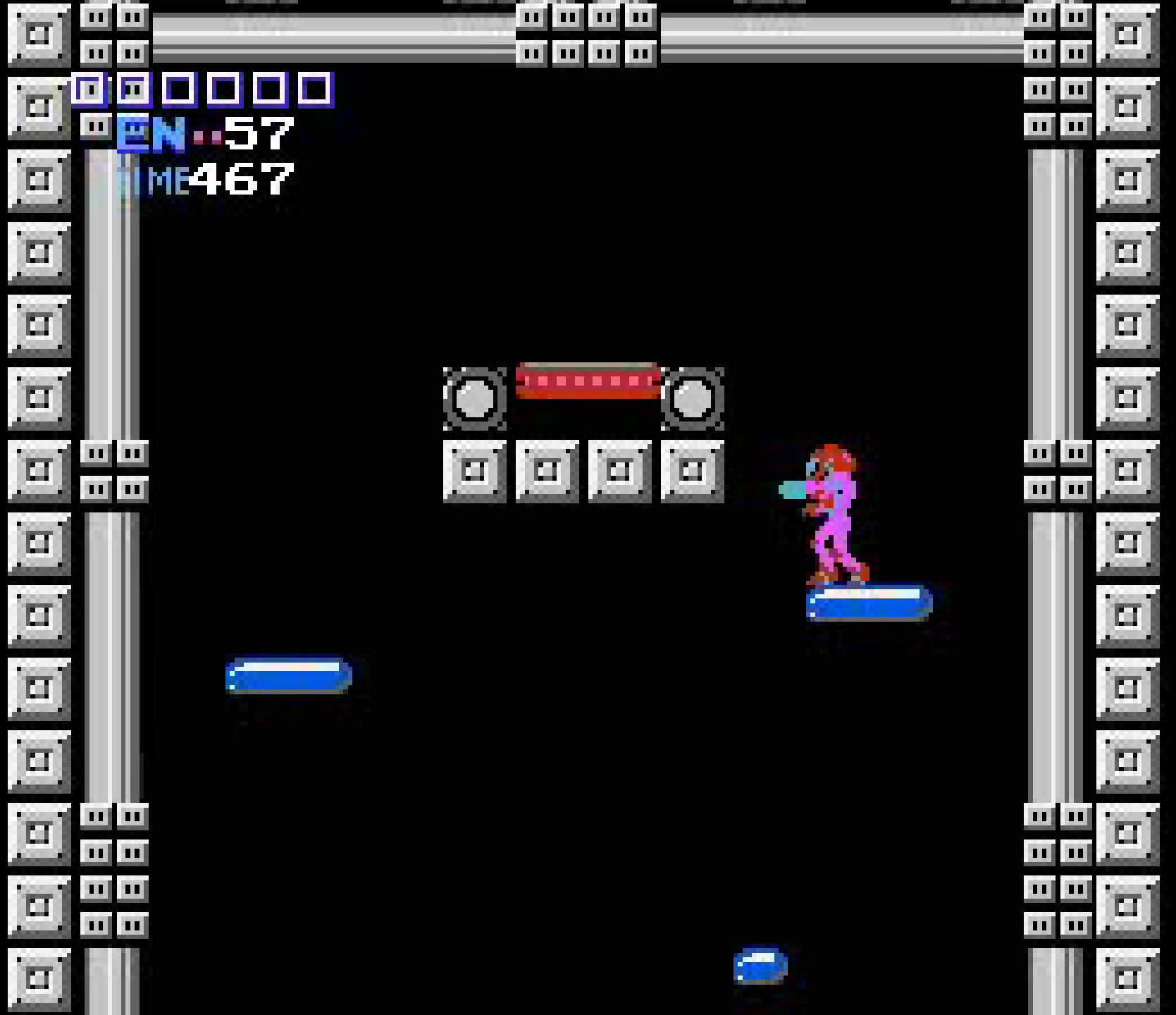

RoHS PY-BL-T043ZT268A


Remove


Remove
Keep

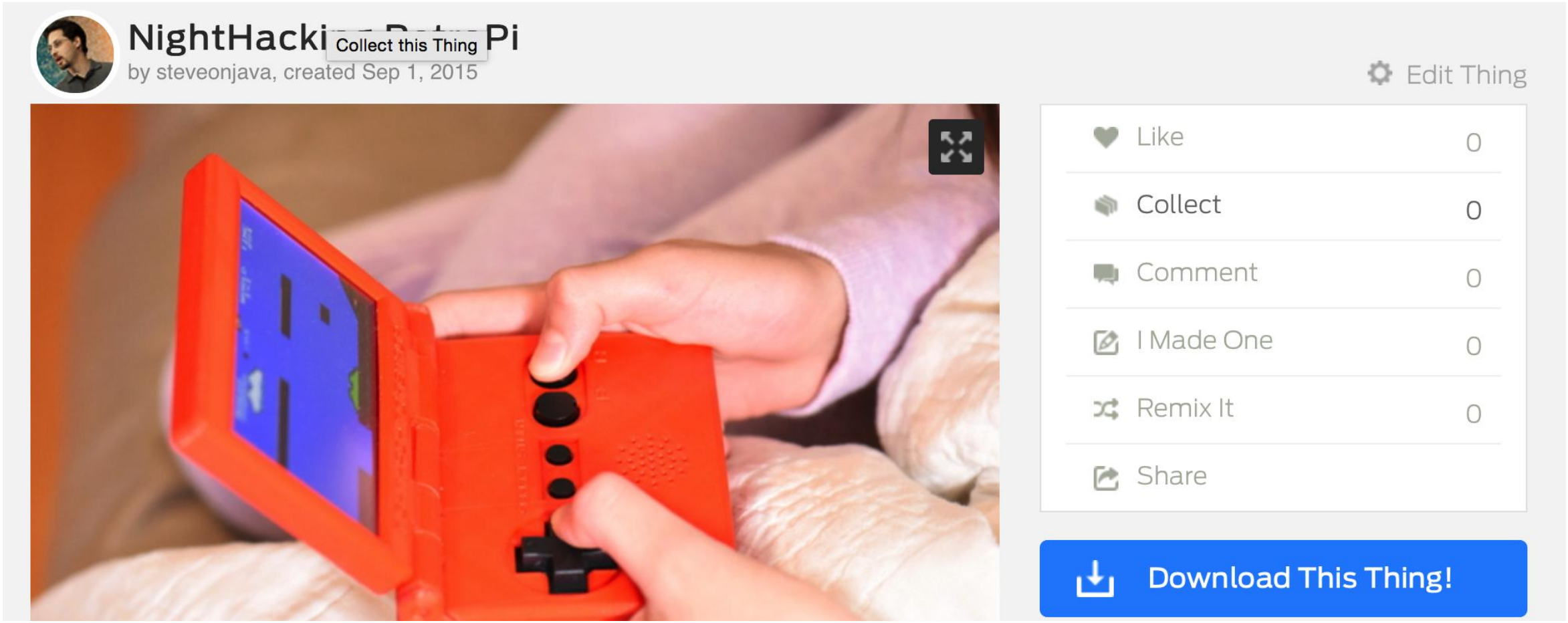

MARIO
002800
×02
WORLD
1-1
TIME
000
NIGHTHACKING RETROPI


MARIO
005100
×09
WORLD
1-1
TIME
DIGITRACKING RETRO


EN..57
TIME467

Instructions on Thingiverse

http://www.thingiverse.com/thing:993901



Raspberry Pi with Java

raspberrypiwithjava.com

Stephen Chin
tweet: @steveonjava
blog: http://steveonjava.com

NightHacking Tour

Real Geeks
Live Hacking

nighthacking.com

Safe Harbor Statement

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