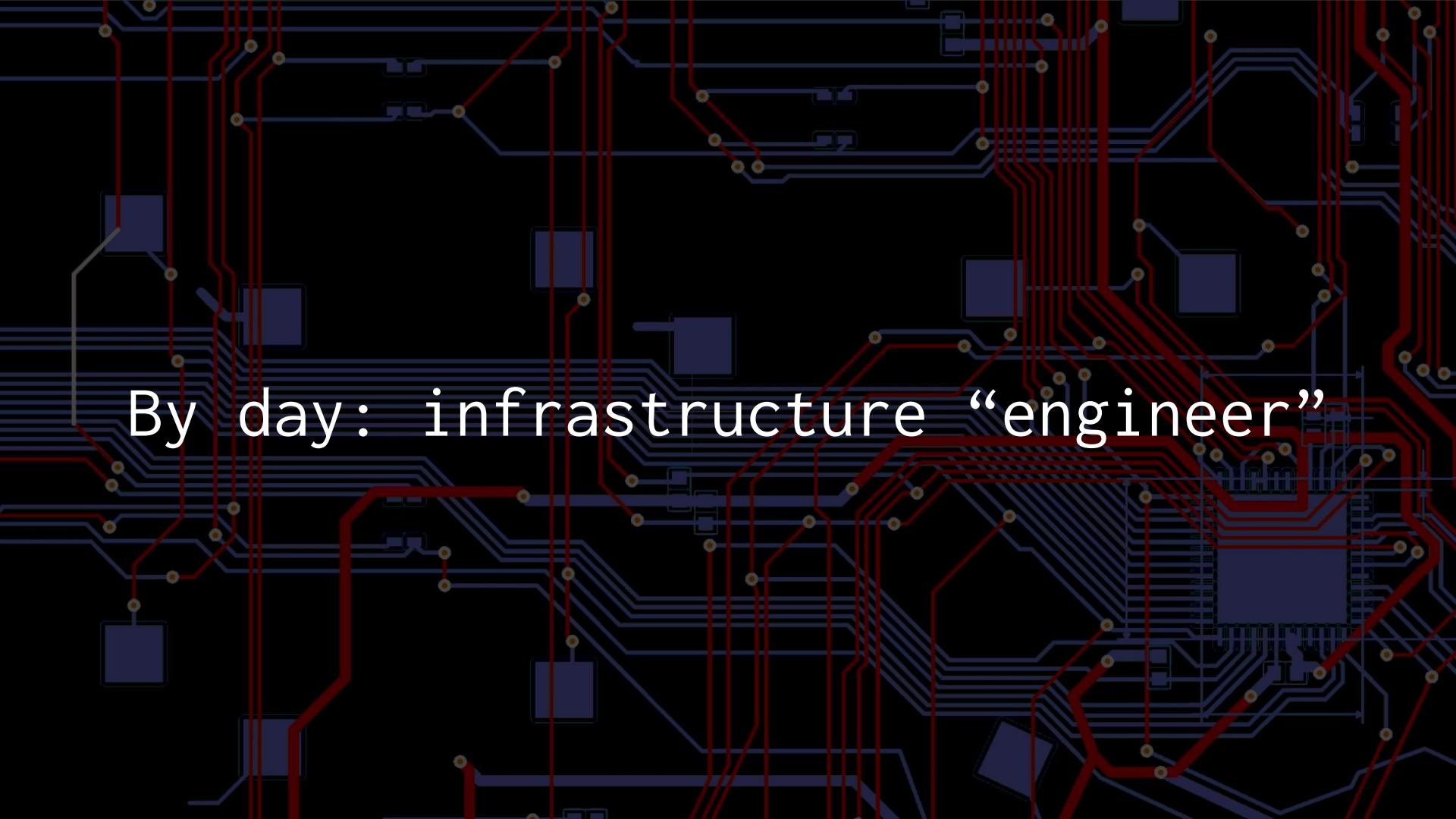
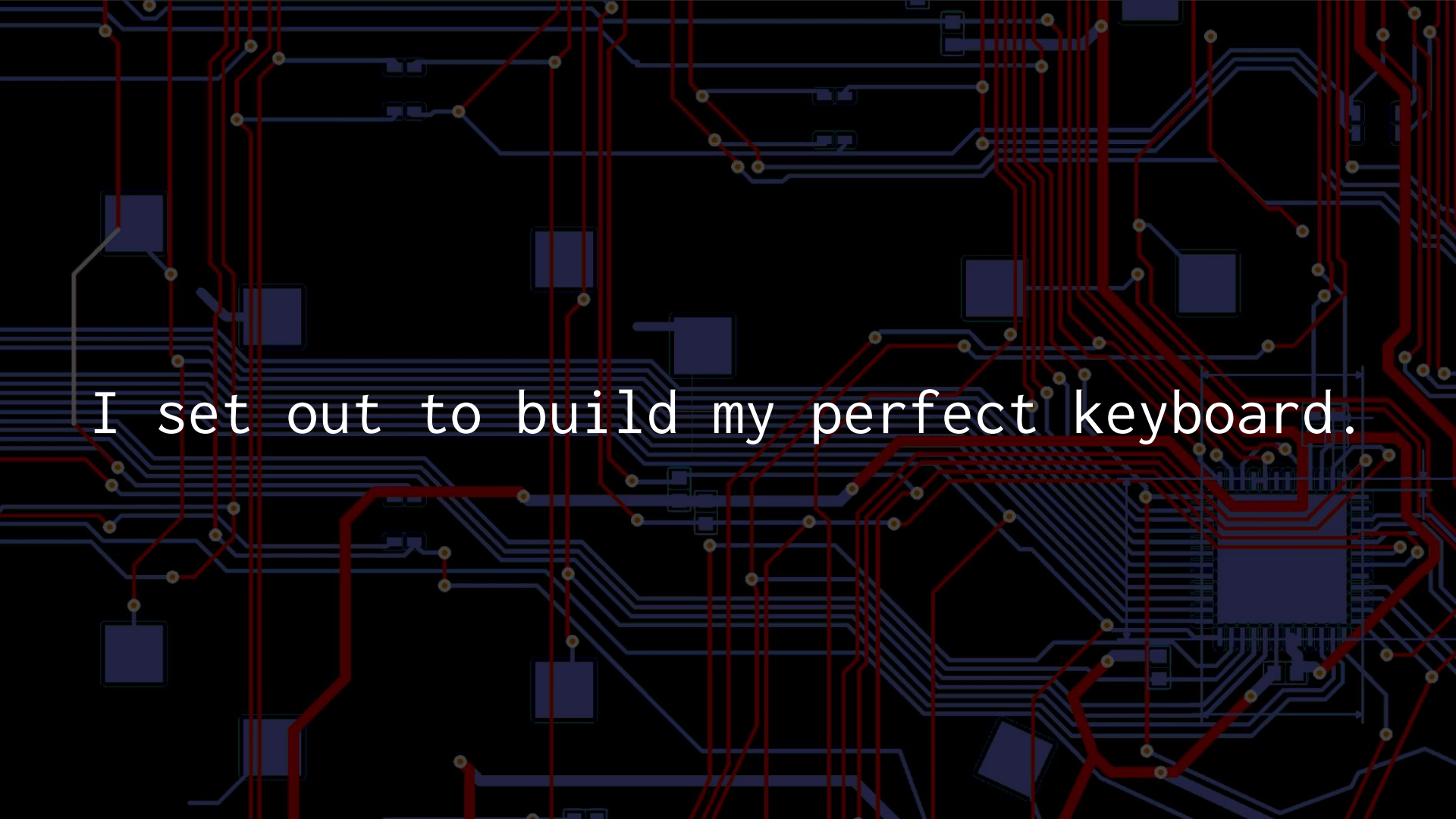
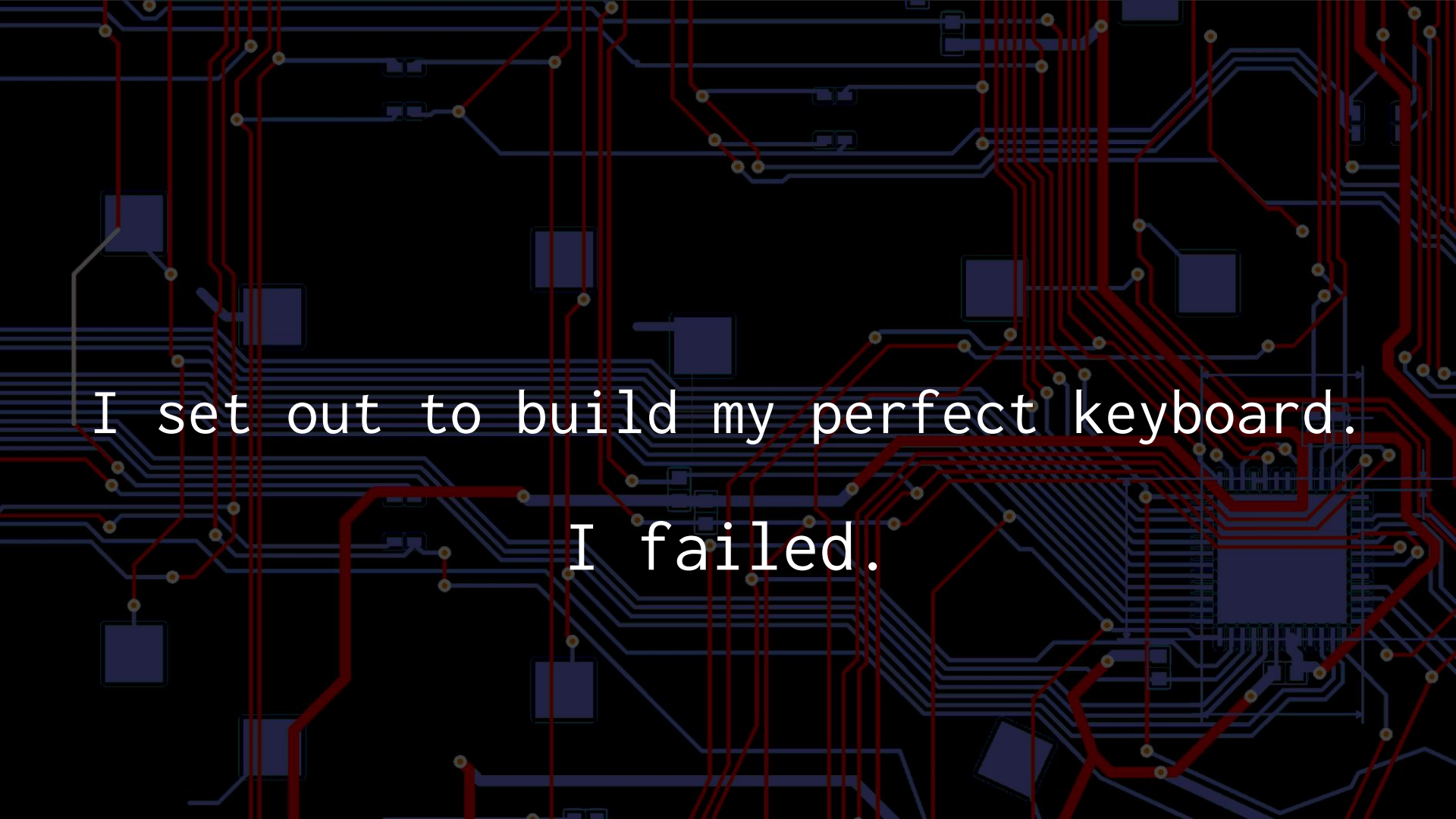
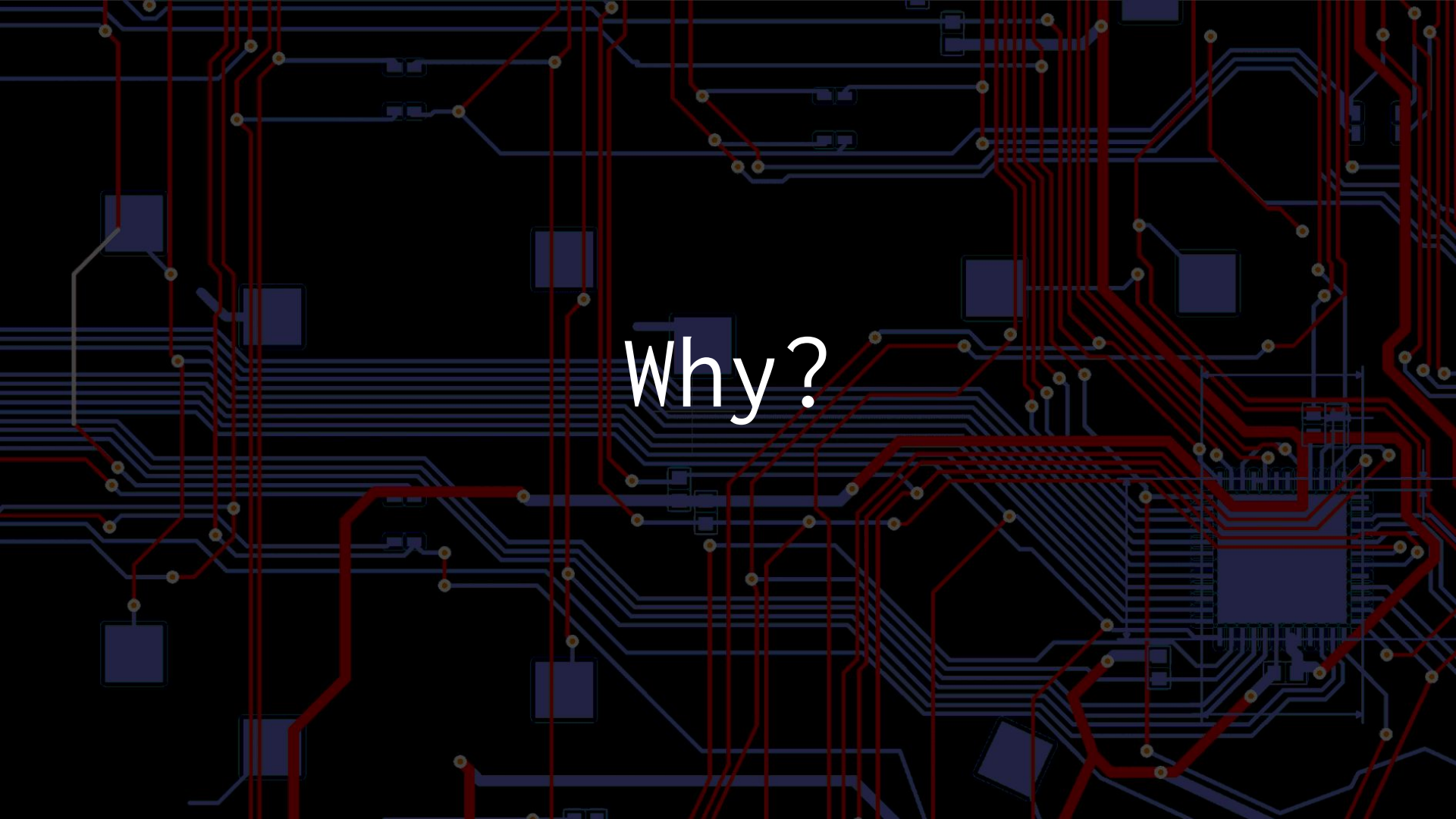
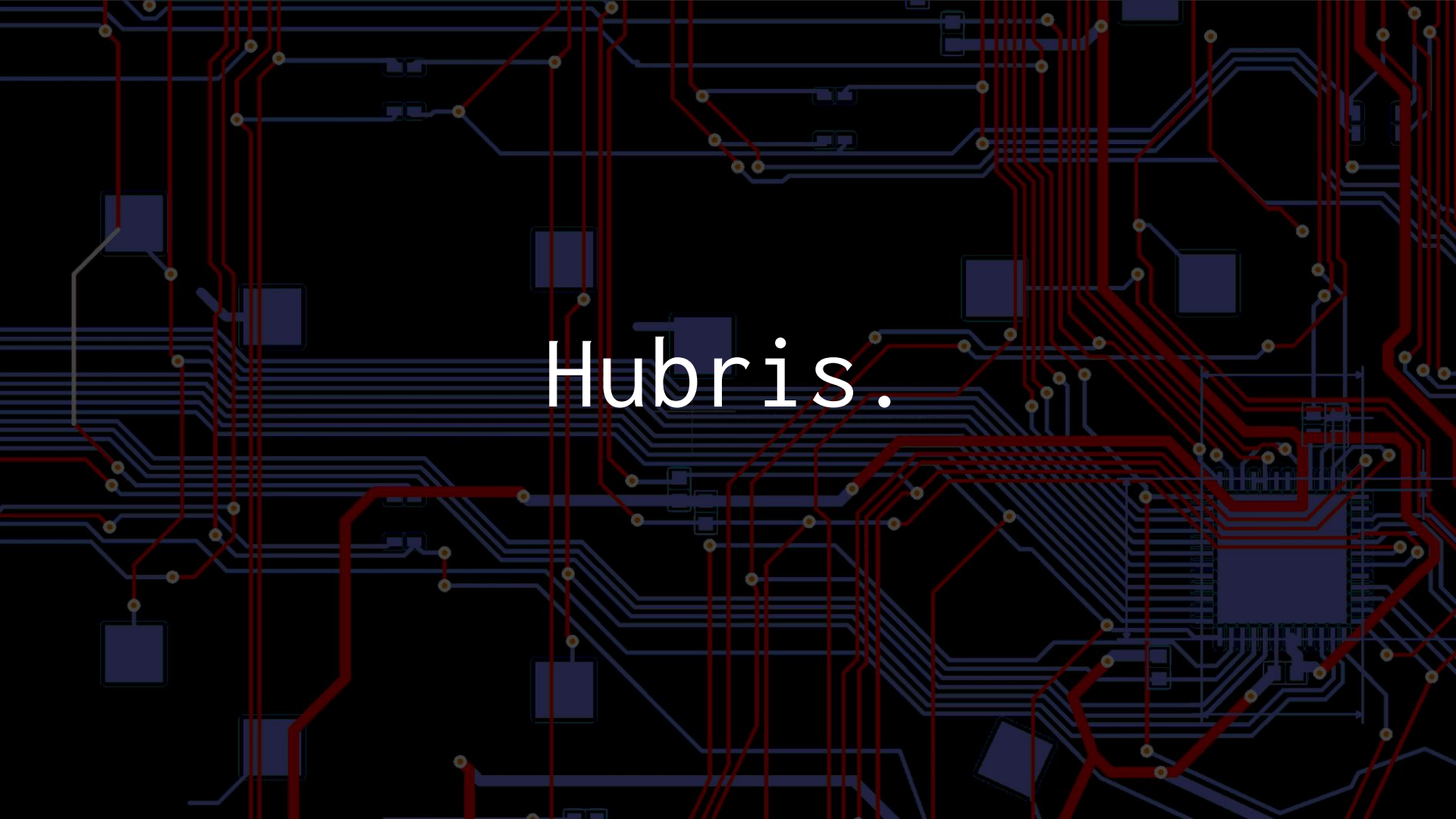
Keyboardin’ Ain’t Easy???
How to not build a keyboard!!!
Liz Frost :: stillinbeta :: she/her


By day: infrastructure “engineer”


I set out to build my perfect keyboard.


I set out to build my perfect keyboard.
I failed.


Why?


Hubris.

DSA Dark Magical Girl

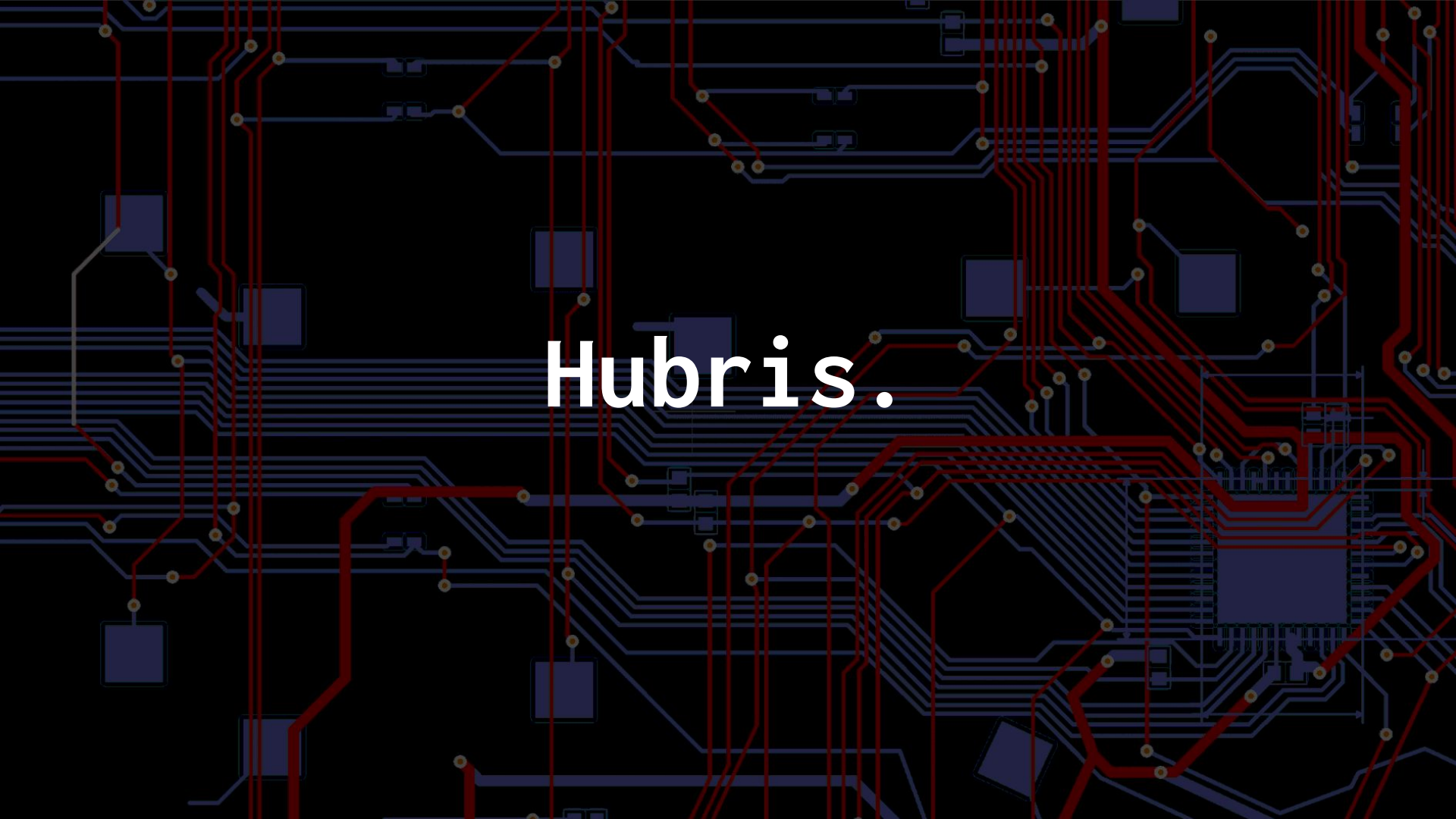
Microsoft

Feature List

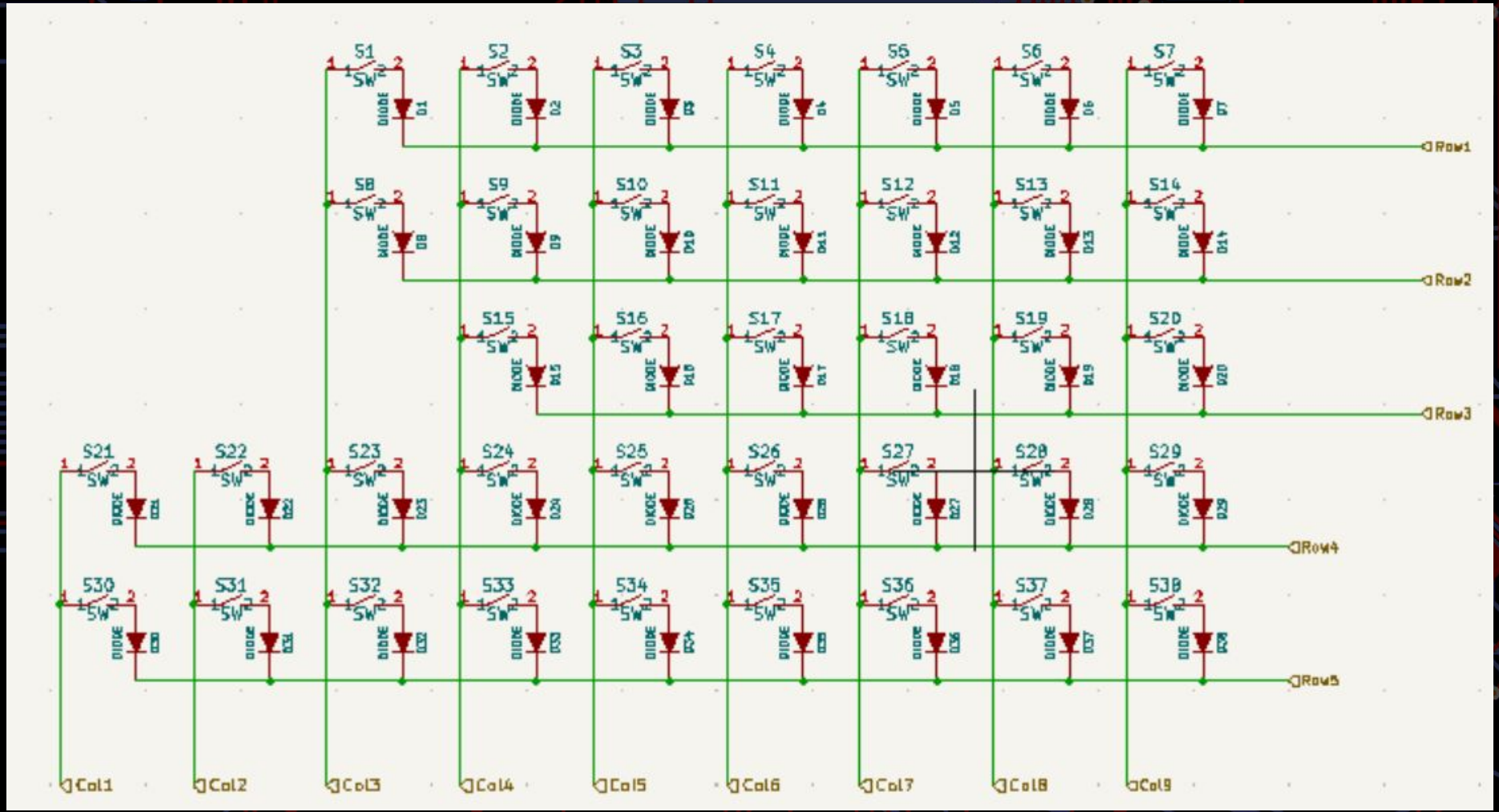
- ✓ Split Keyboard
- ✓ USB C
- ✓ Cool Screens
- ✗ Gamer RGBLEDs
- ✗ Connector on Right

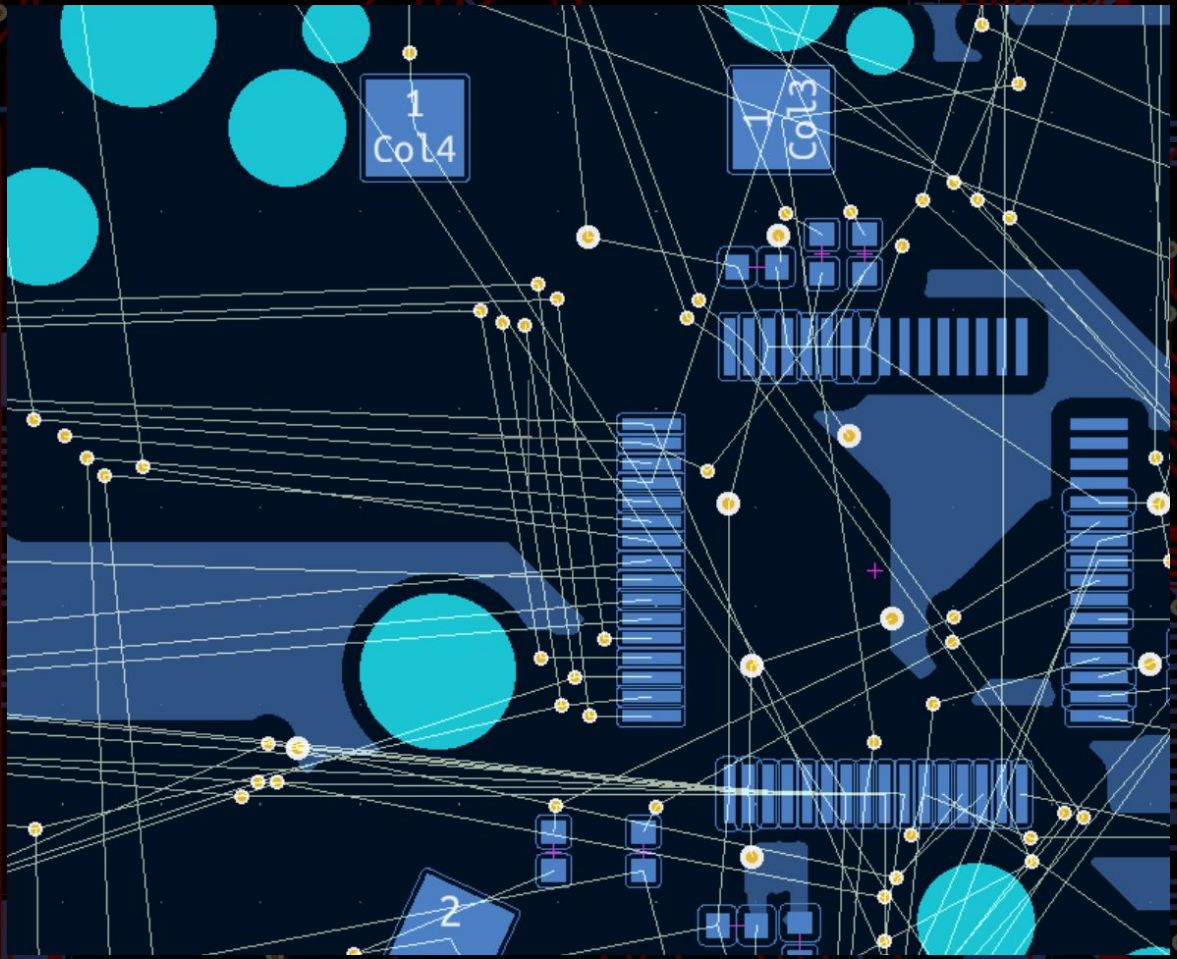
Feature List

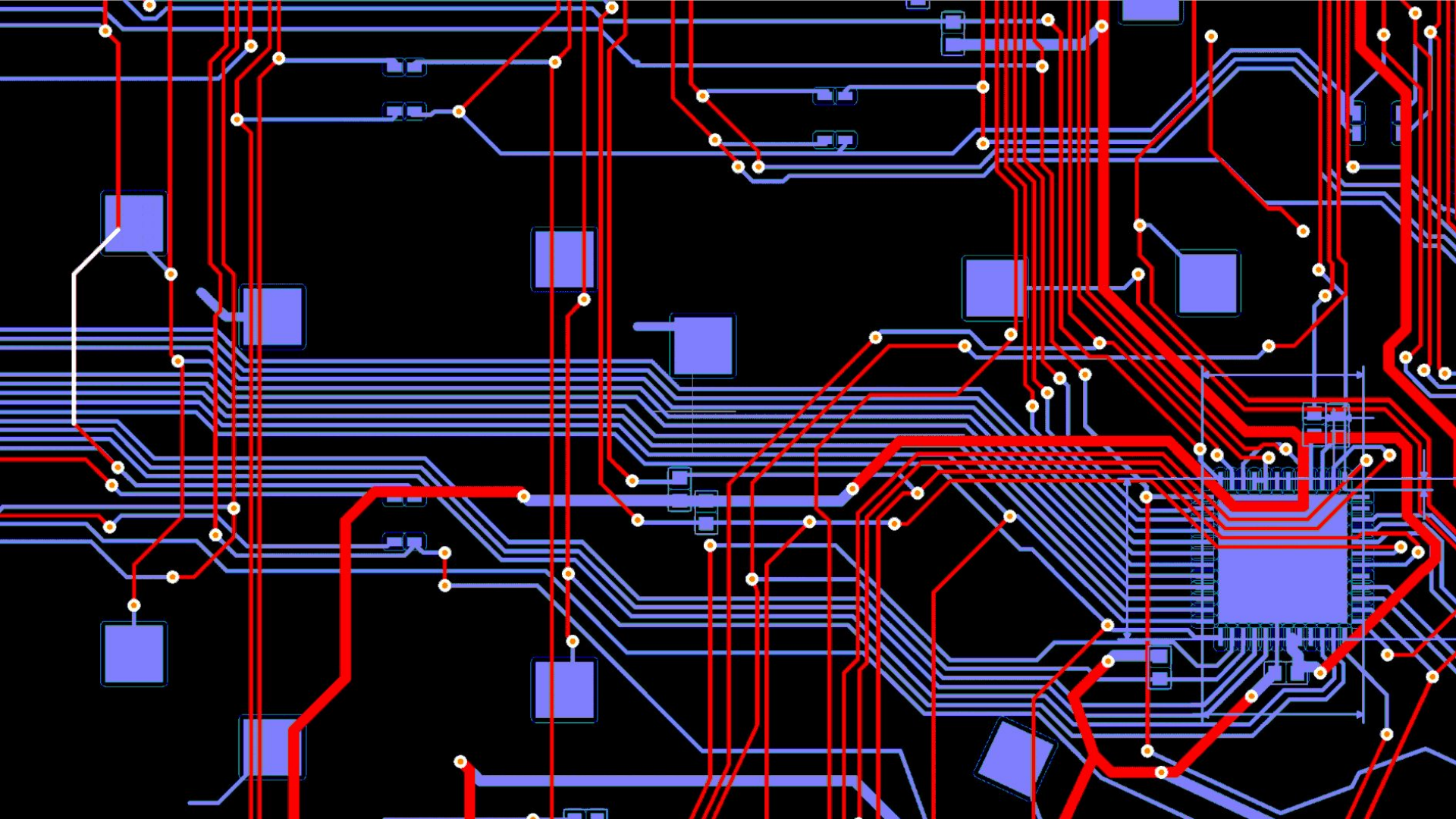
- ✓ Split Keyboard
- ✓ USB C
- ✓ Cool Screens
- ✗ Gamer RGBLEDs
- ✗ Connector on Right
- ✓ Open Source

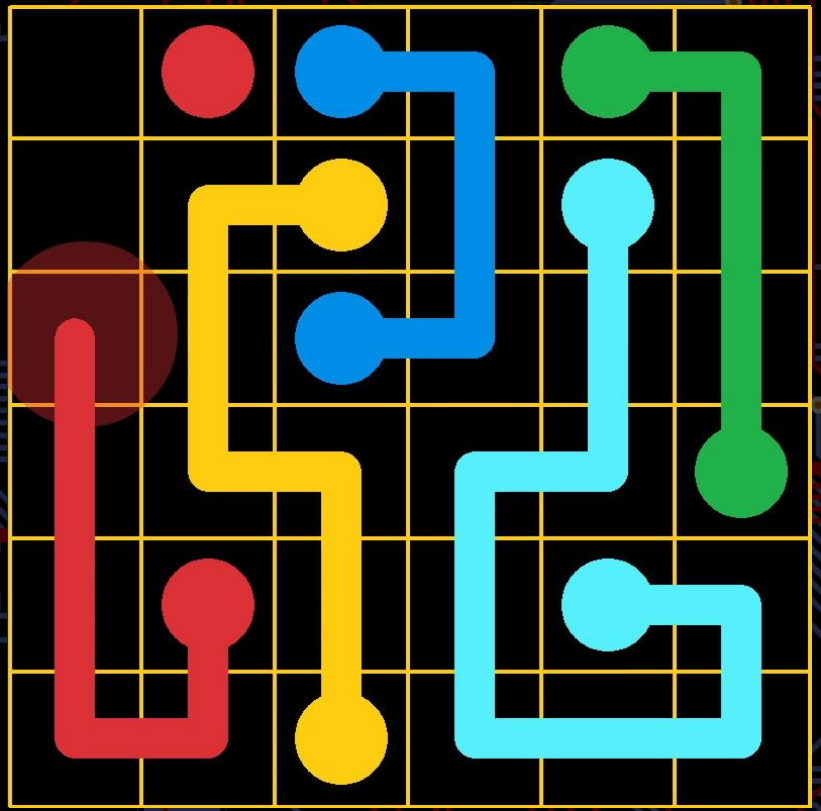

Hubris.

KiCad

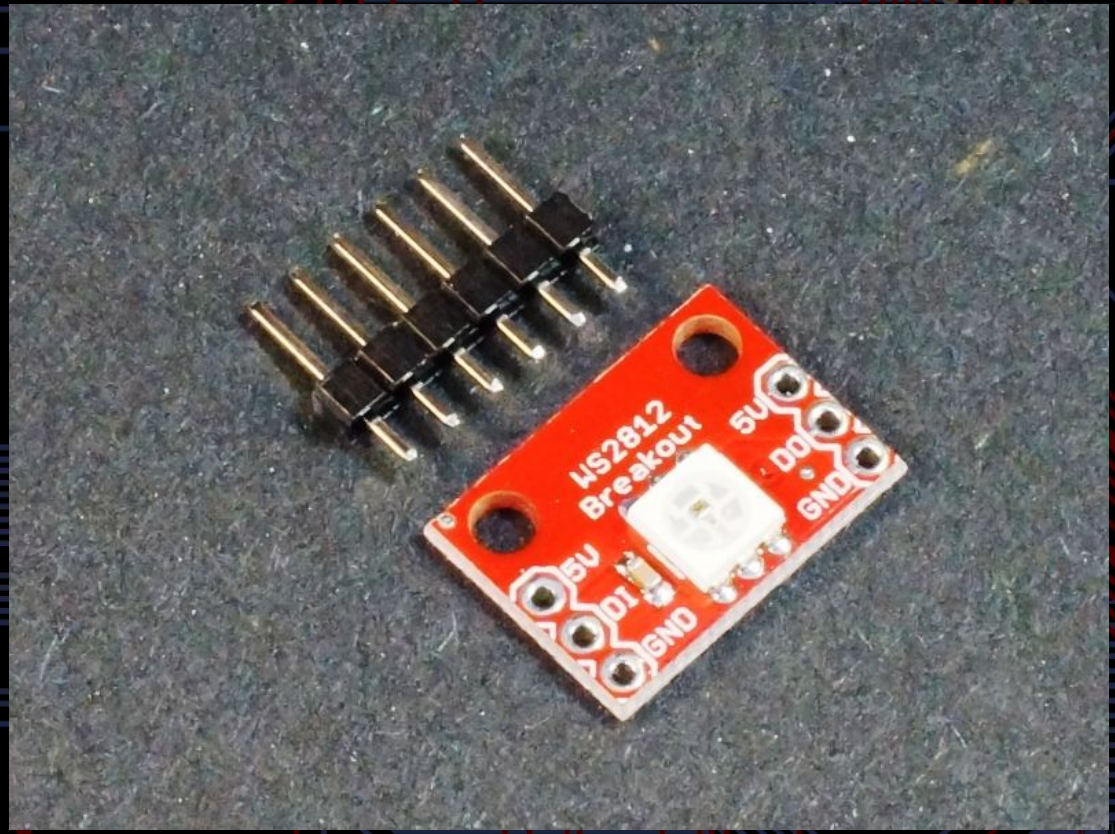

S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
S13
S14
S15
S16
S17
S18
S19
S20
S21
S22
S23
S24
S25
S26
S27
S28
S29
S30
S31
S32
S33
S34
S35
S36
S37
S38
SW
DIODE
Row1
Row2
Row3
Row4
Row5
Col1
Col2
Col3
Col4
Col5
Col6
Col7
Col8
Col9


1
Col4
1
Col3
2

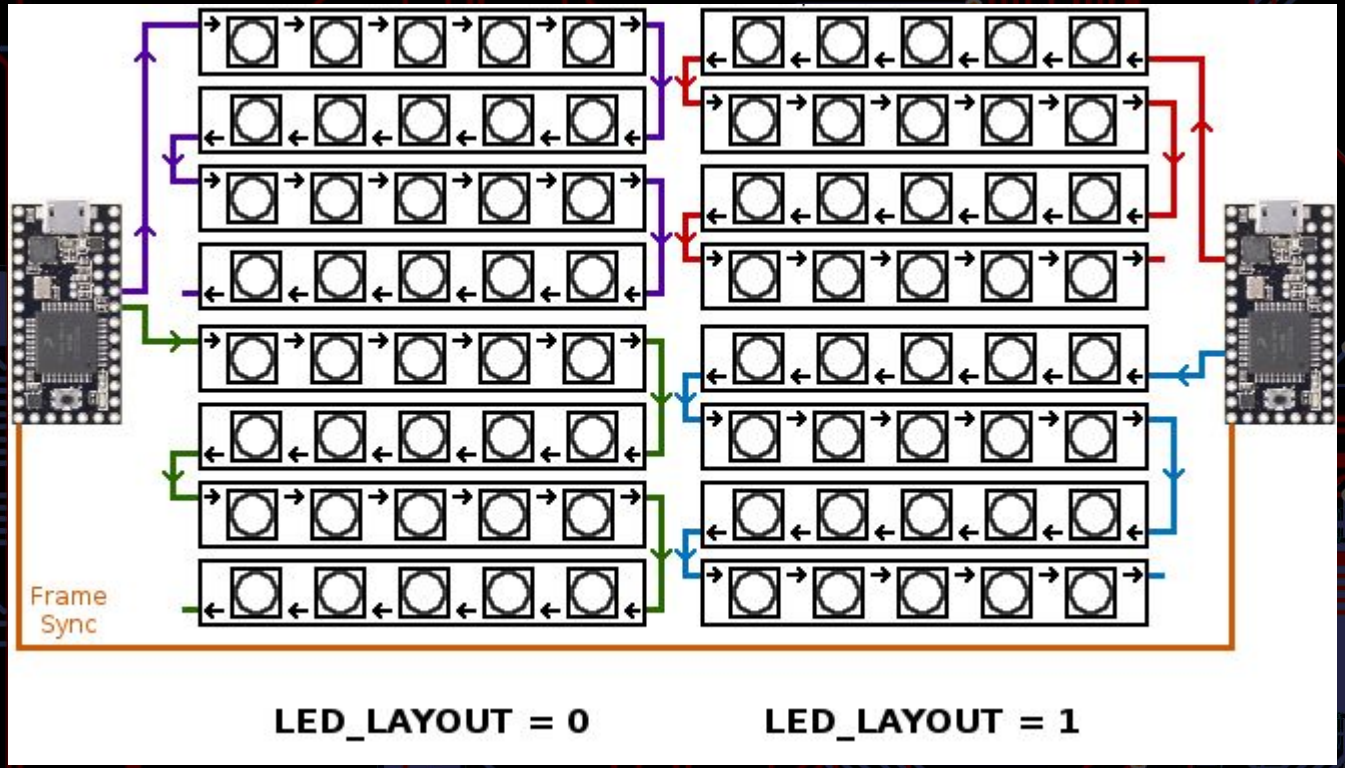




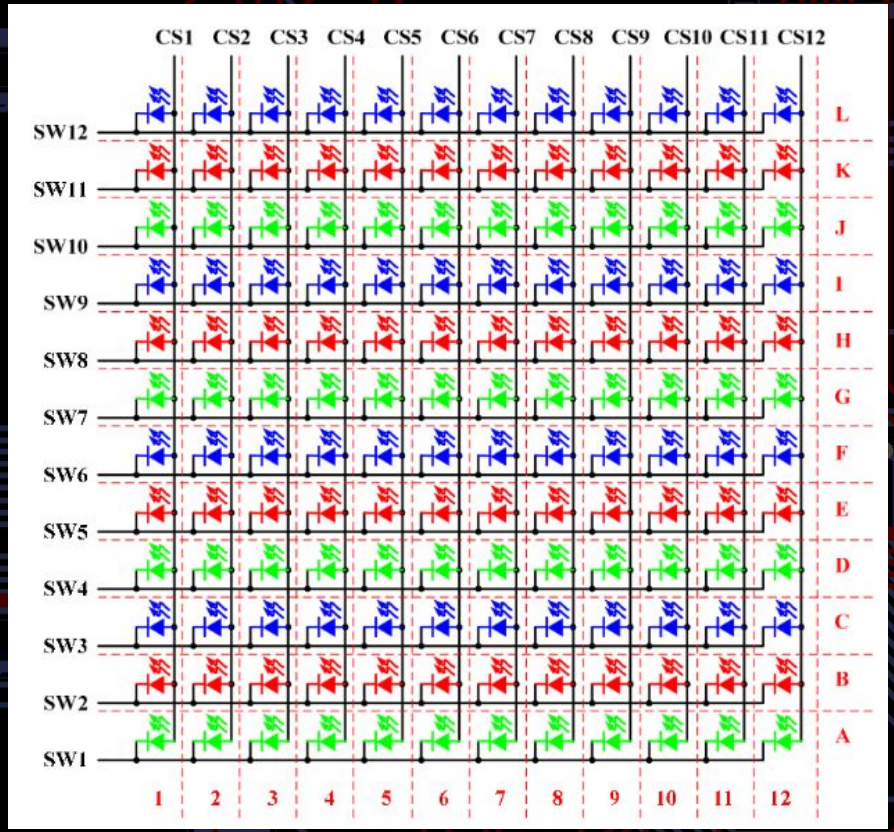
https://www.sourcecodester.com/android/11359/free-flow-game-android.html



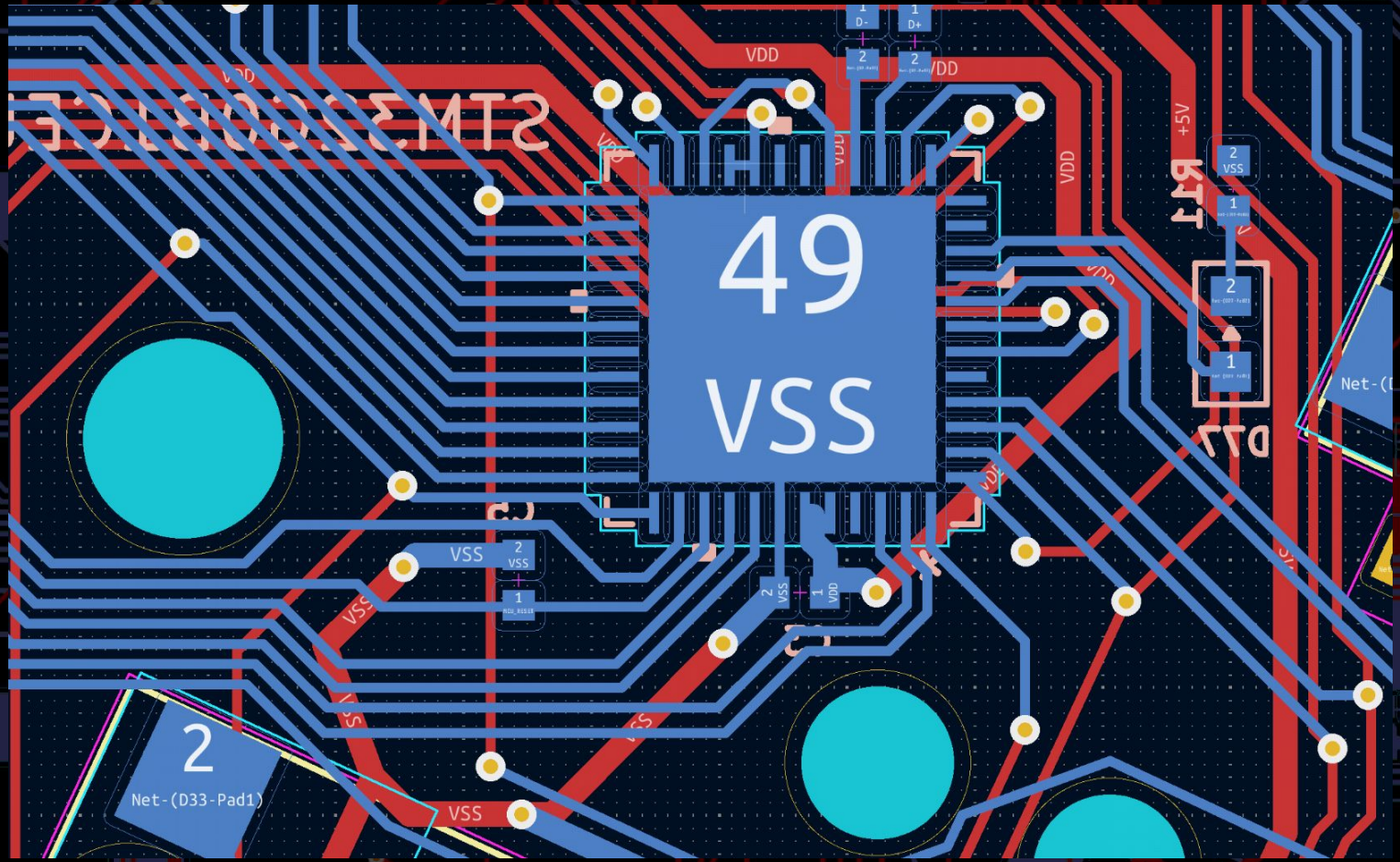
“Neopixel”

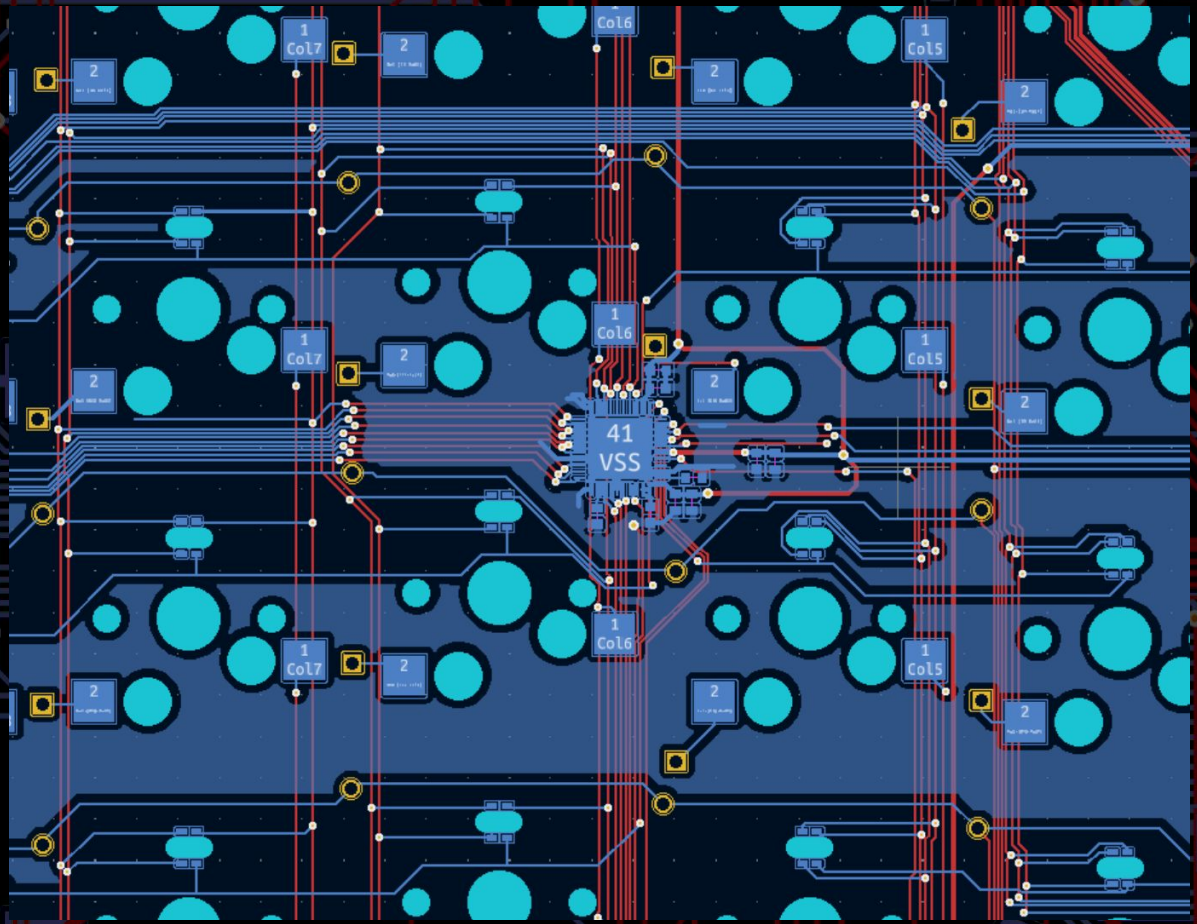


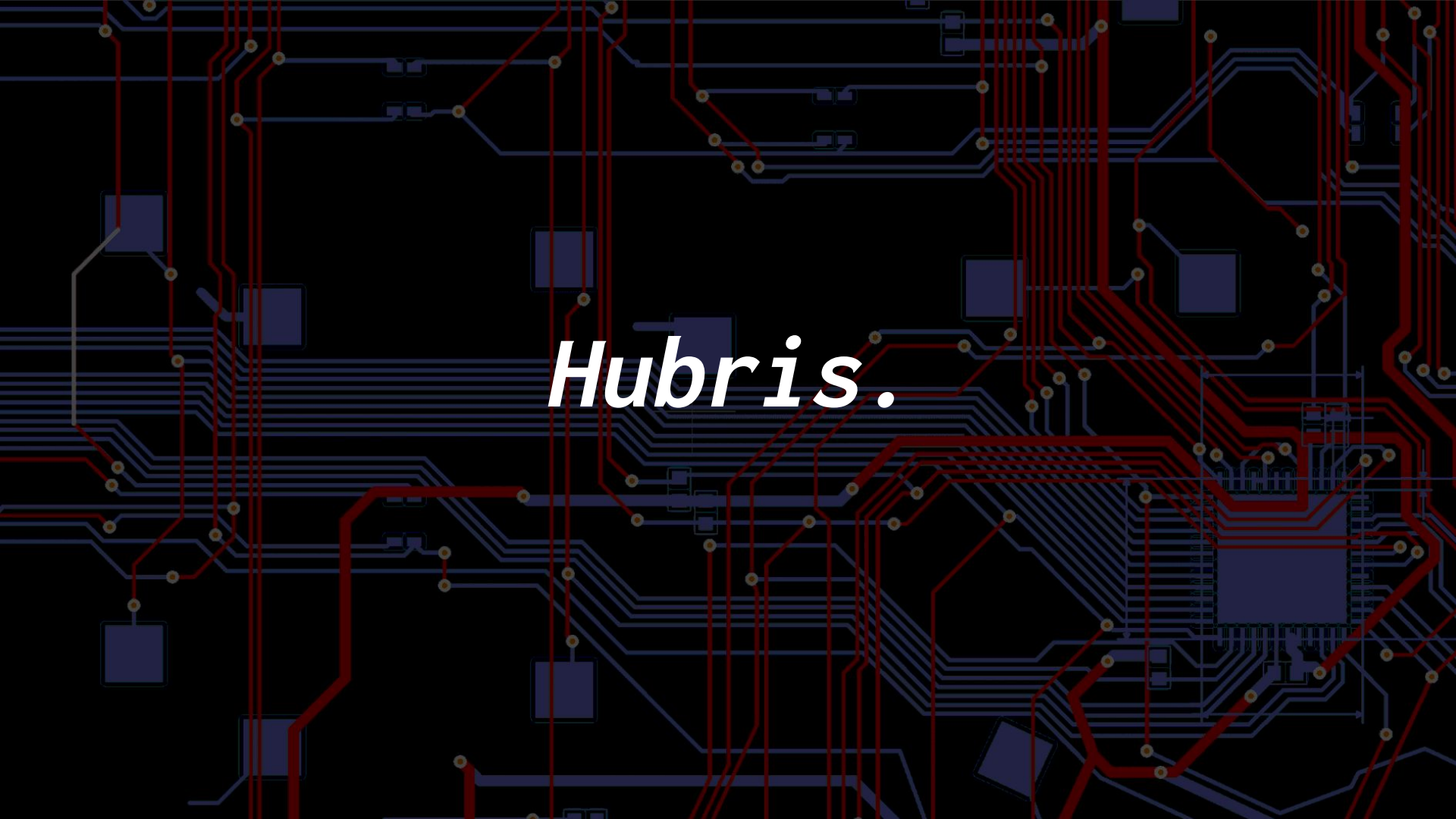
https://forum.pjrc.com/threads/24736-Very-Large-WS2812B-LED-Project-Using-Parts-of-OctoWS2811-Library-Help



https://www.mouser.ca/datasheet/2/1534/IS31FL3737_DS-3394664.pdf


49
VSS
VDD
VSS
+5V
2
Net-(D33-Pad1)


1
Col7
2
1
Col6
2
1
Col5
2
1
Col7
2
1
Col6
2
1
Col5
2
41
VSS
1
Col7
2
1
Col6
2
1
Col5
2


Hubris.

Sorry to bother you, but there is an issue that we want to confirm with you before proceeding.

As shown below, the hole to hole clearance is too narrow.

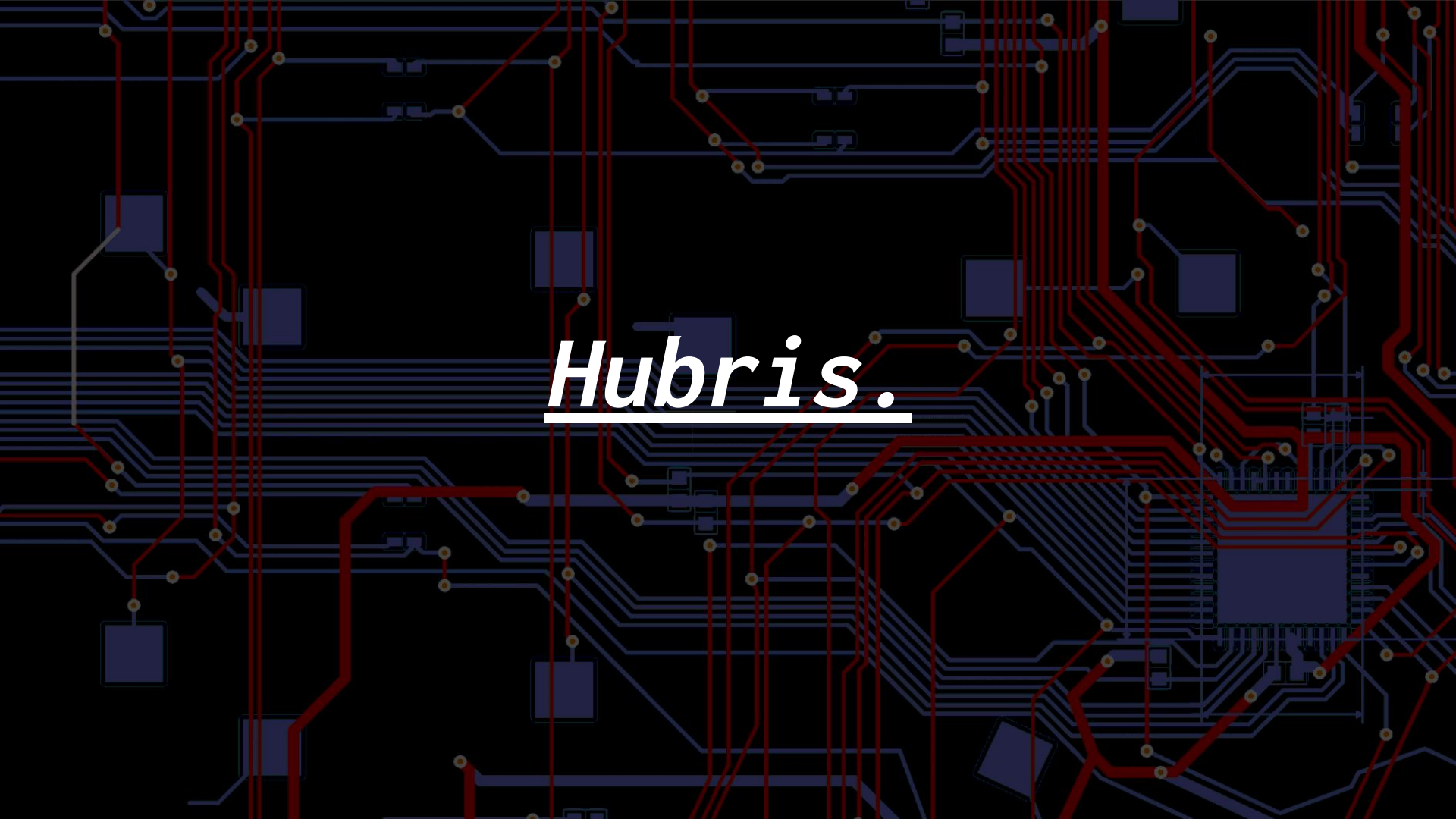
Shall we reduce the holes diameter to make finished holes diameter as 0.4mm holes?

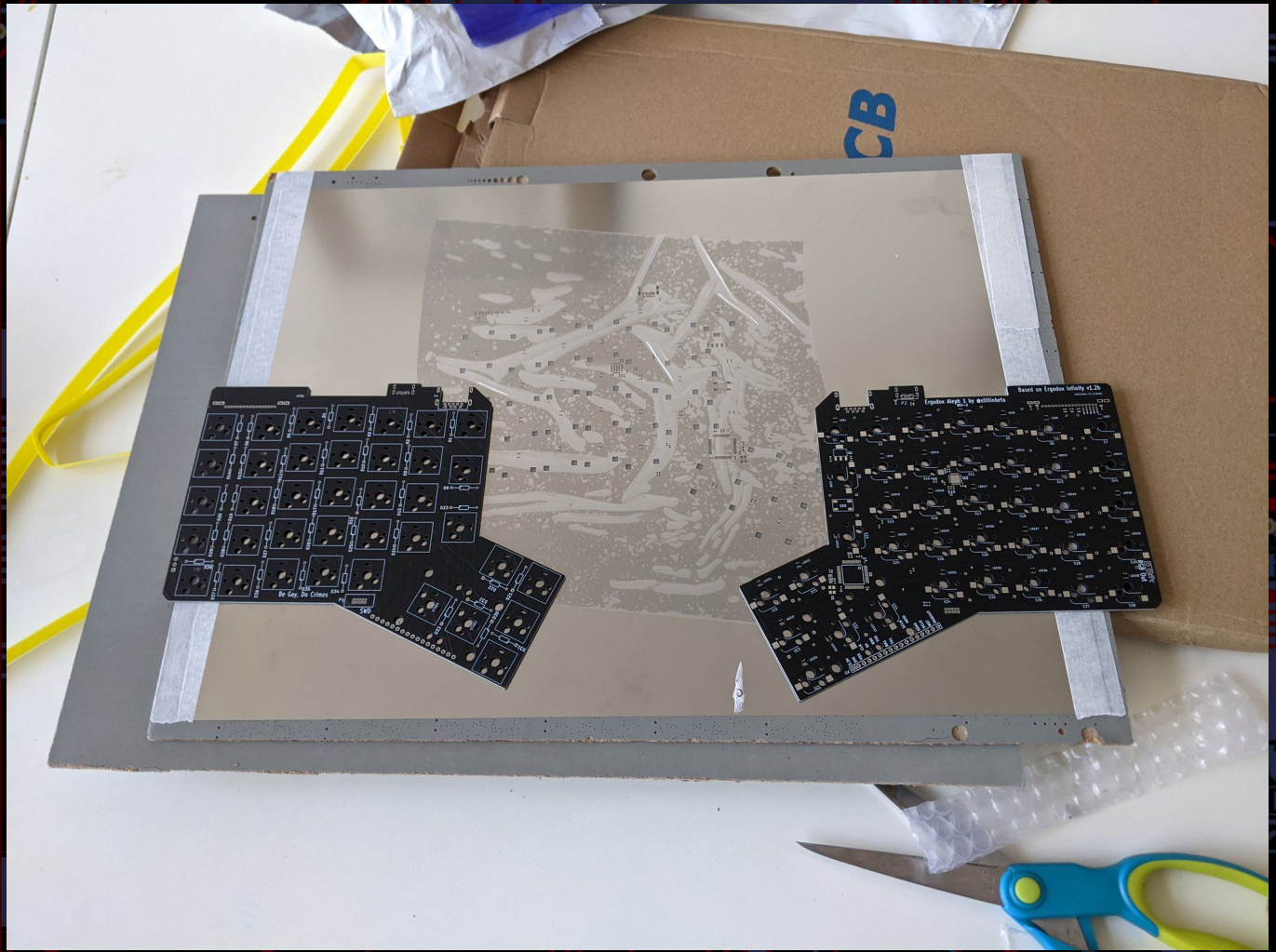
Copper

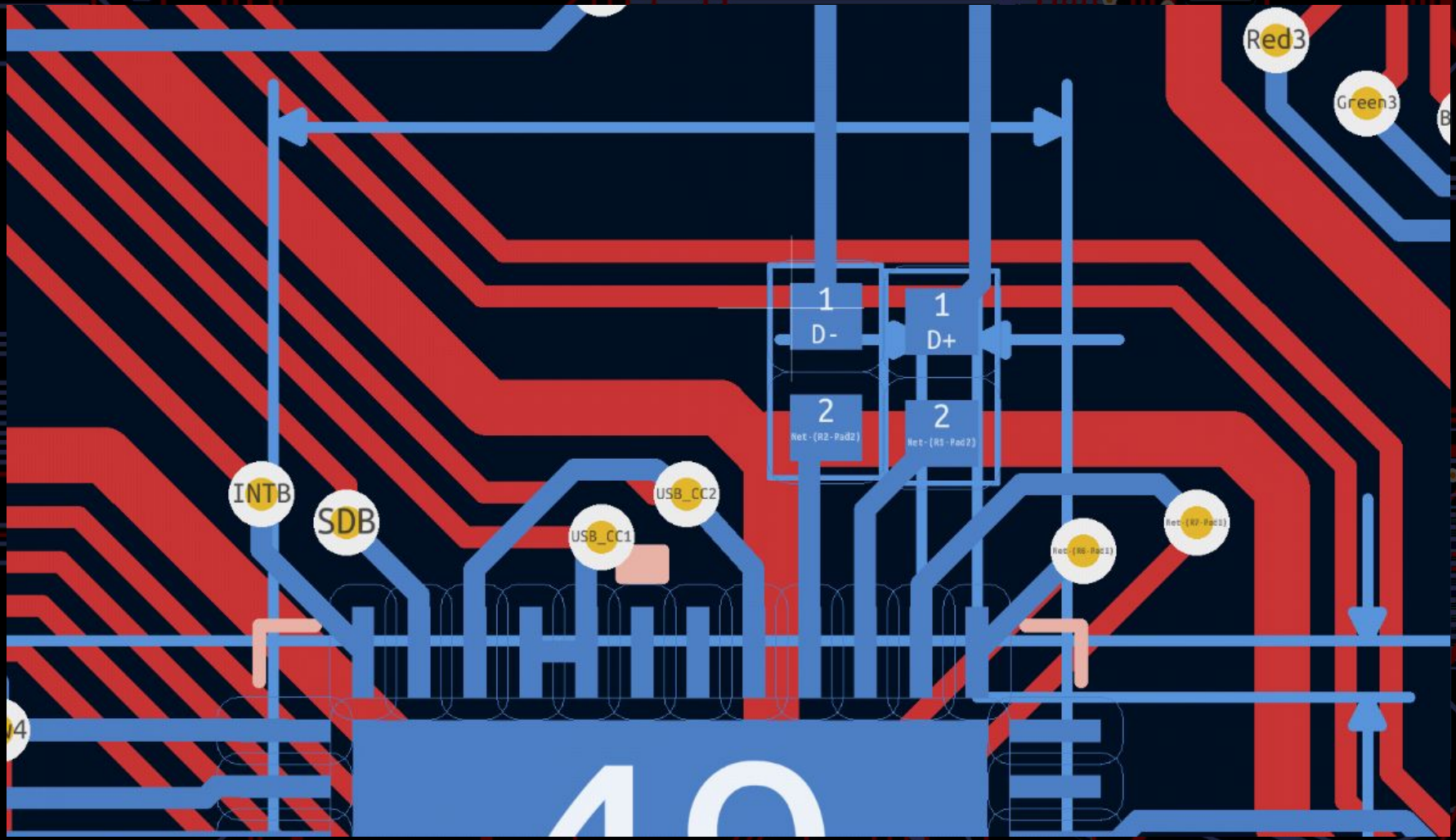
Minimum clearance:	0	mm
Minimum track width:	0.127	mm
Minimum annular width:	0.05	mm
Minimum via diameter:	0.4	mm
Copper to hole clearance:	0.25	mm
Copper to edge clearance:	0.0635	mm

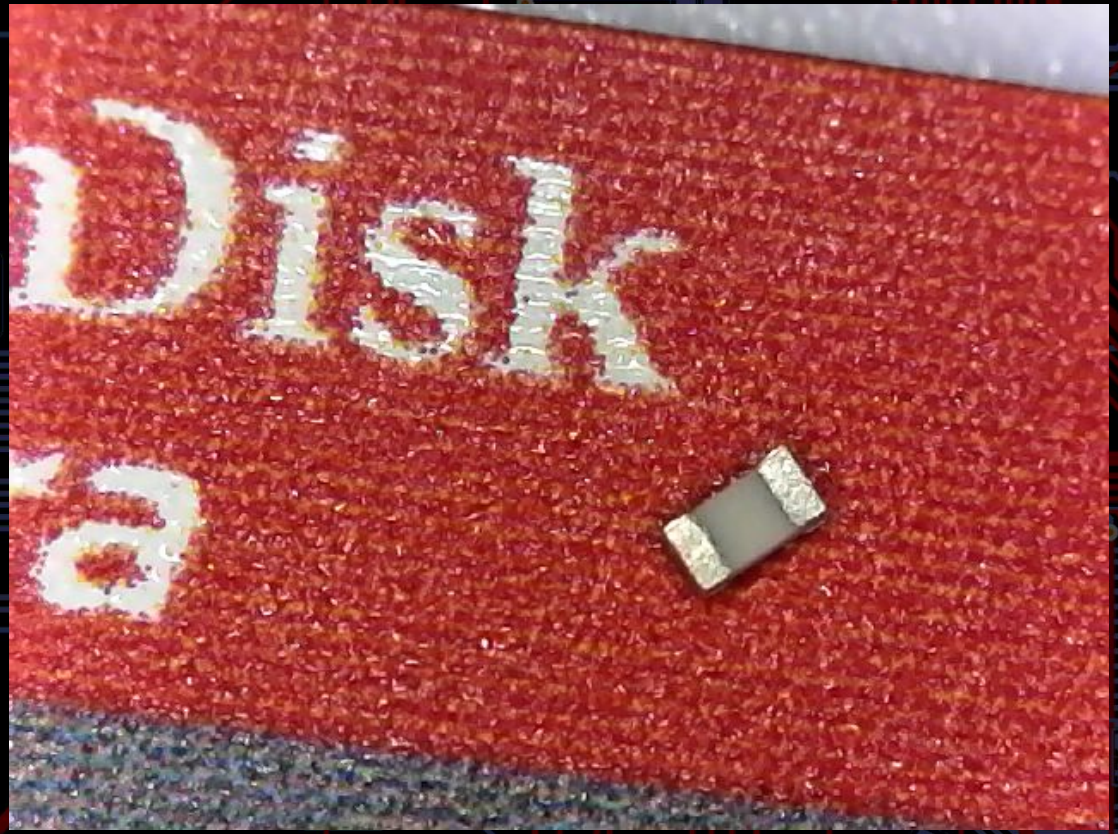
Holes

Minimum through hole:	0.2032	mm
Hole to hole clearance:	0.25	mm

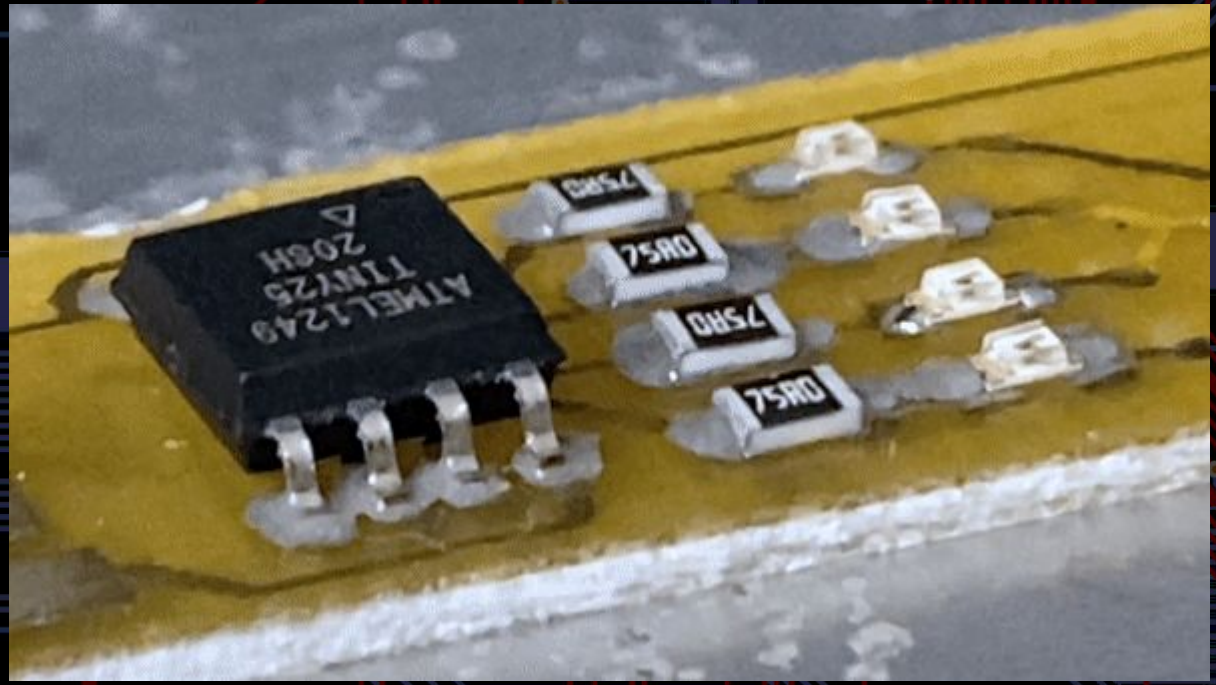

Hubris.


Based on Ergodox Infinity v1.2b
Ergodox Aleph 5 by @stillilabeta
Be Gay, Do Crimes

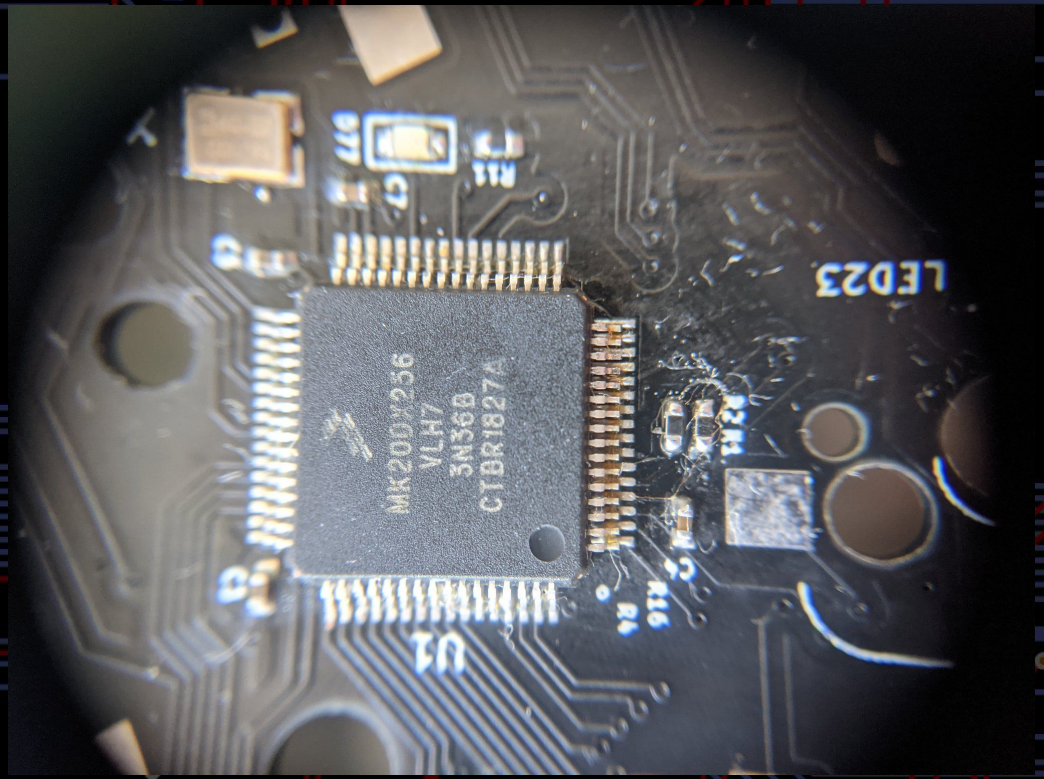

Red3
Green3
1
D-
1
D+
2
2
INTB
SDB
USB_CC2
USB_CC1

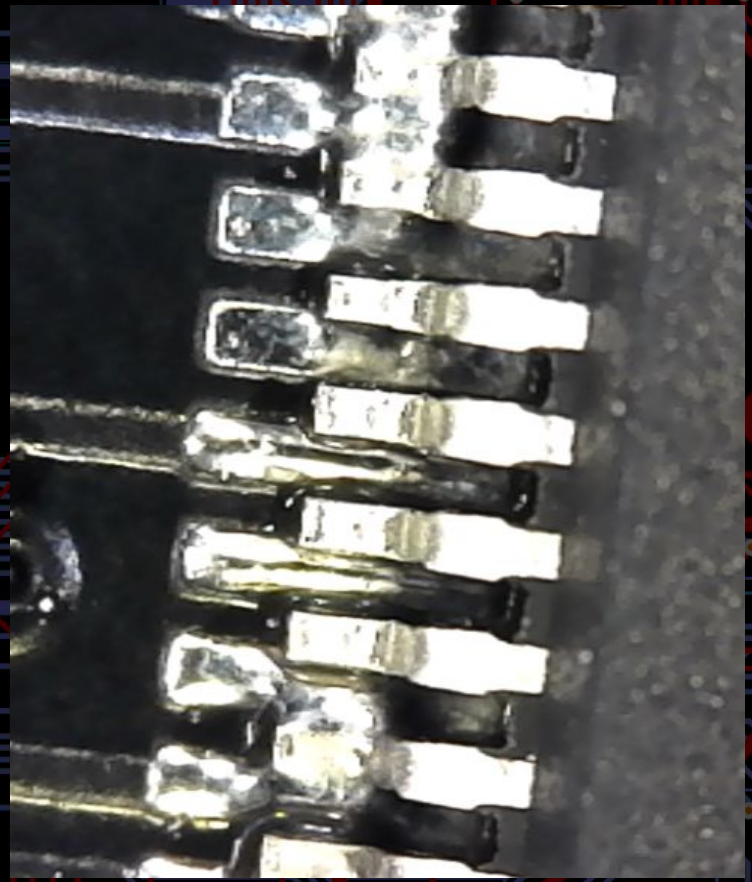

Disk

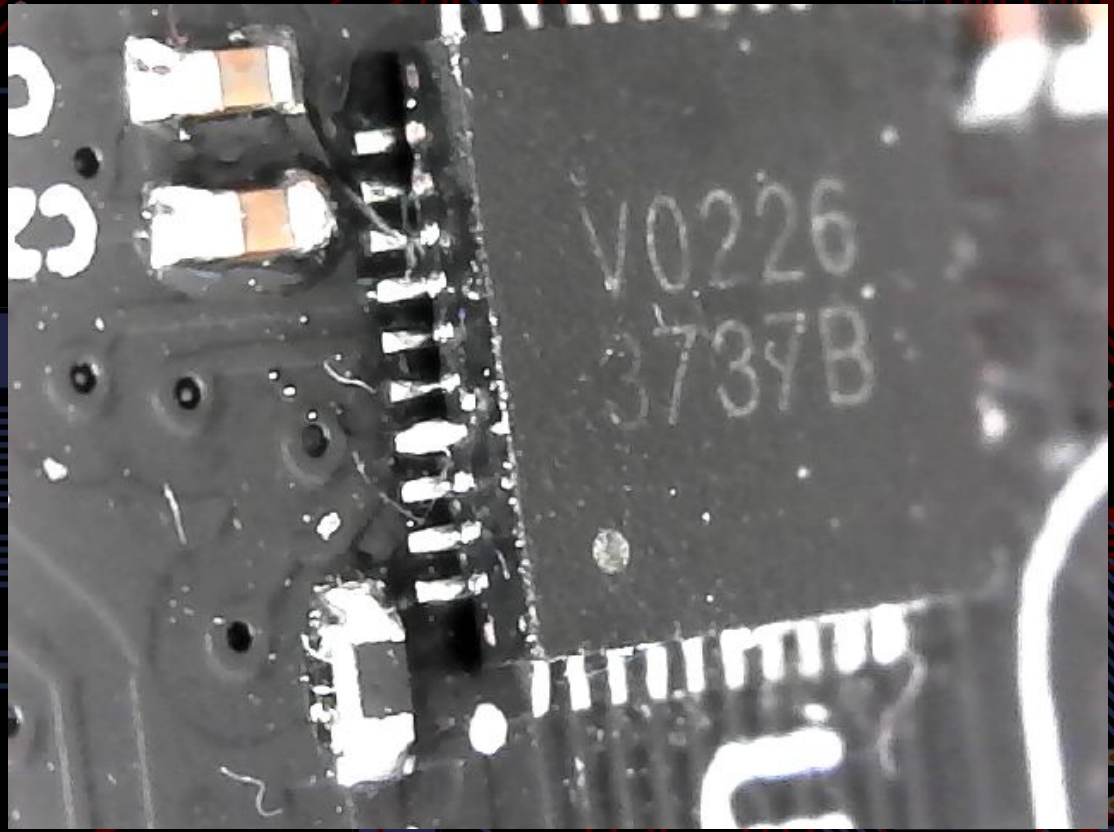
SanDisk
Ultra
64GB
micro SD XC I
10

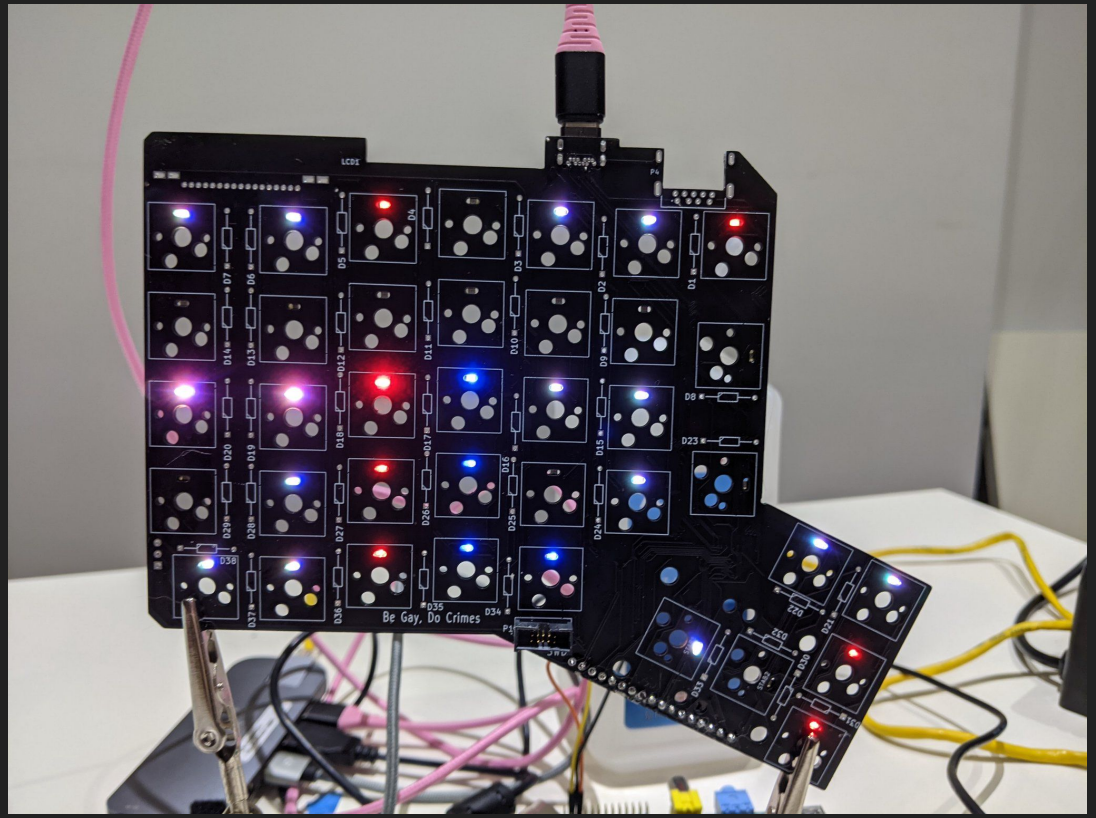


https://www.botfactory.co/blog/what-s-new-at-botfactory-1/post/solder-with-botfactory-153


LED23
U1




V0226
3737B

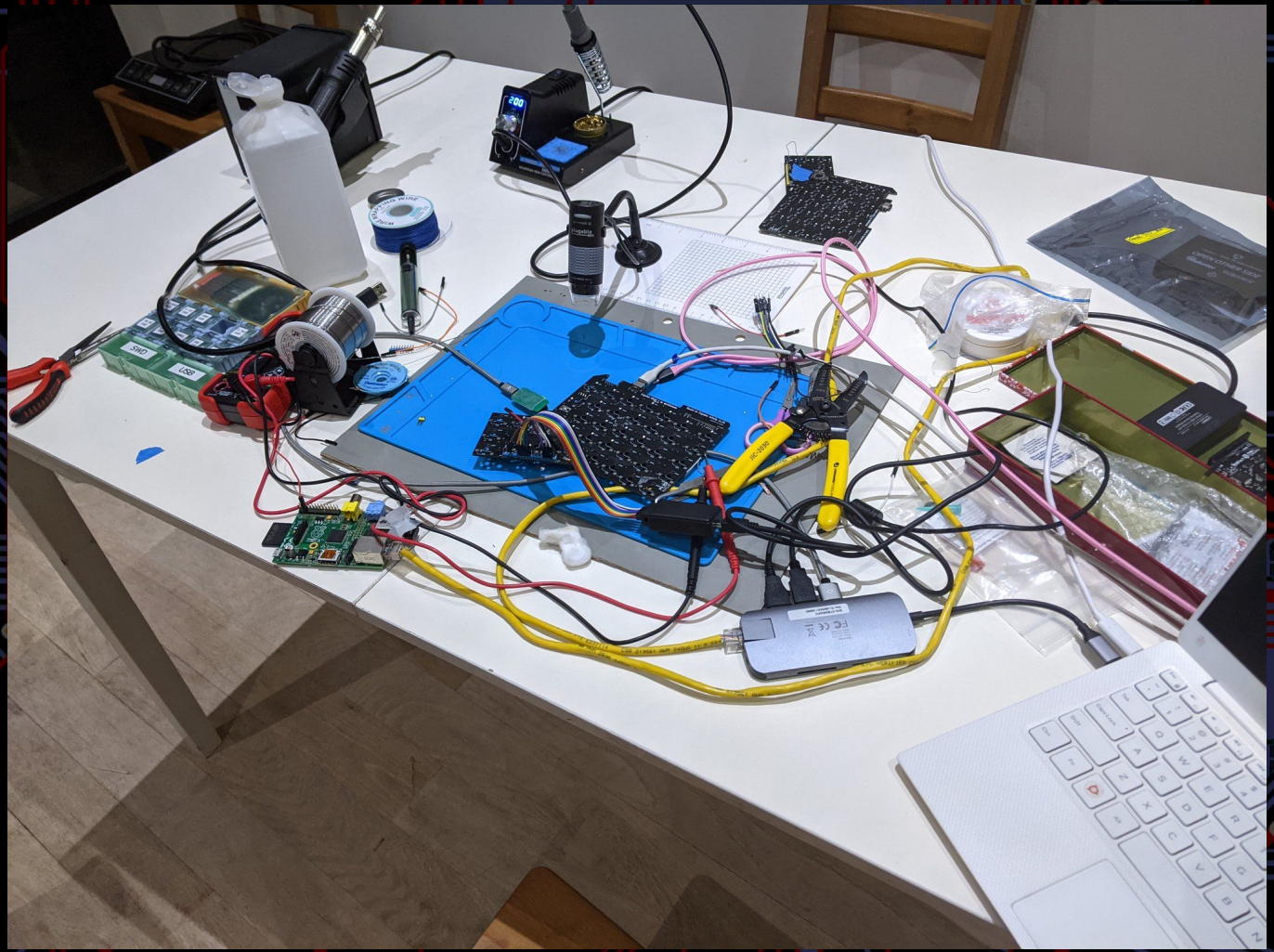


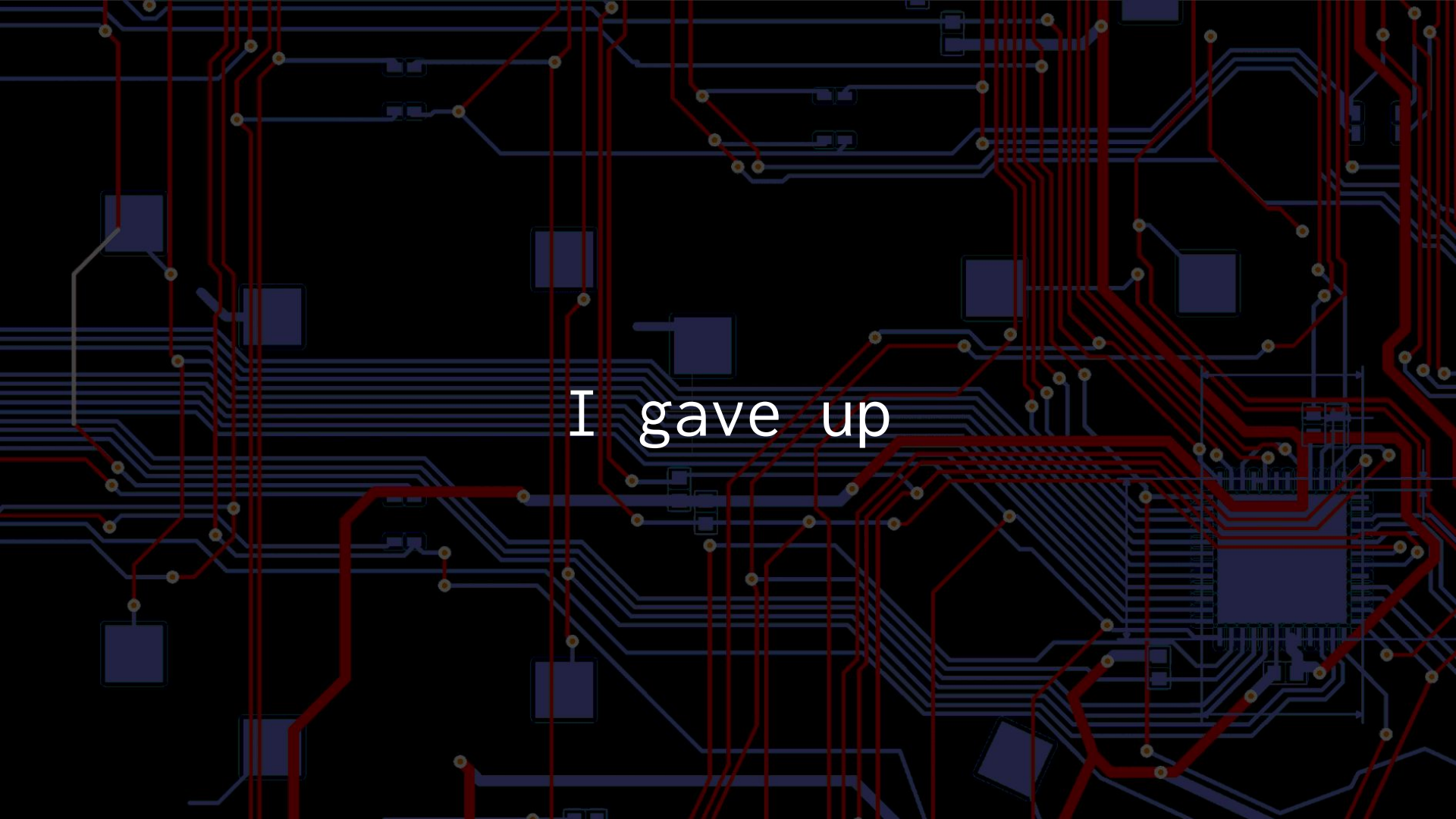
Hubris

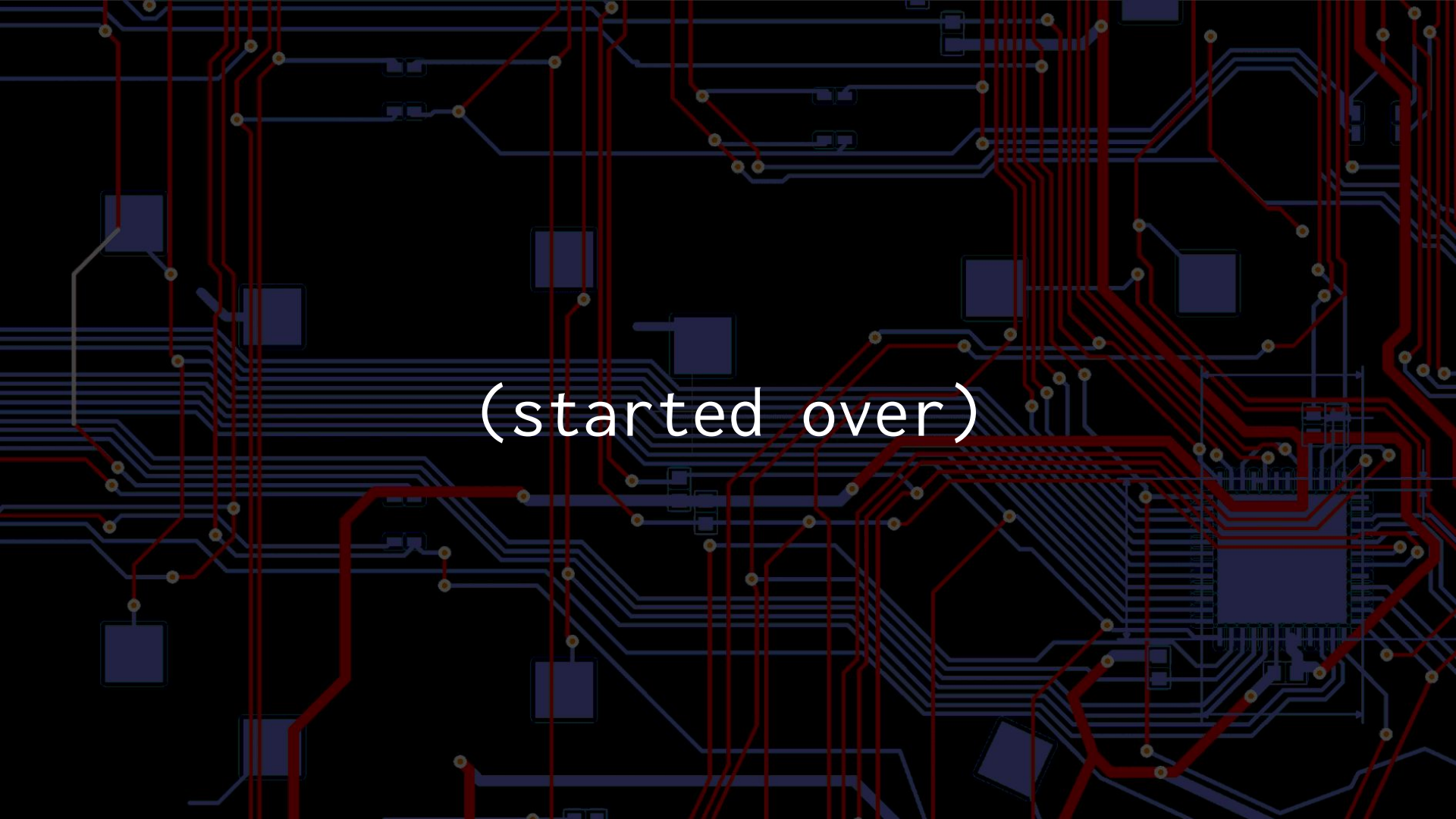
What did you think would happen?

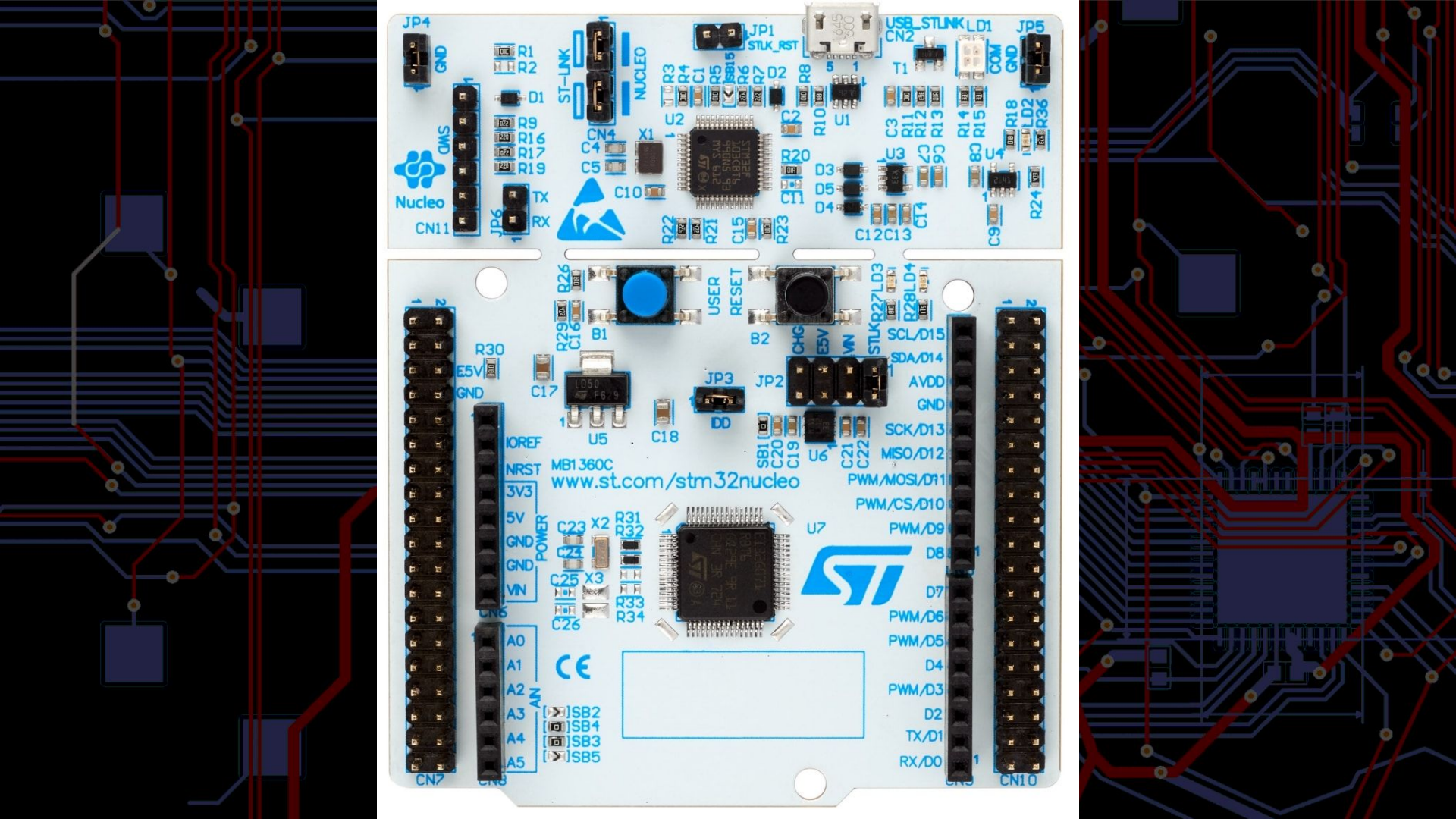
Things that might be wrong.

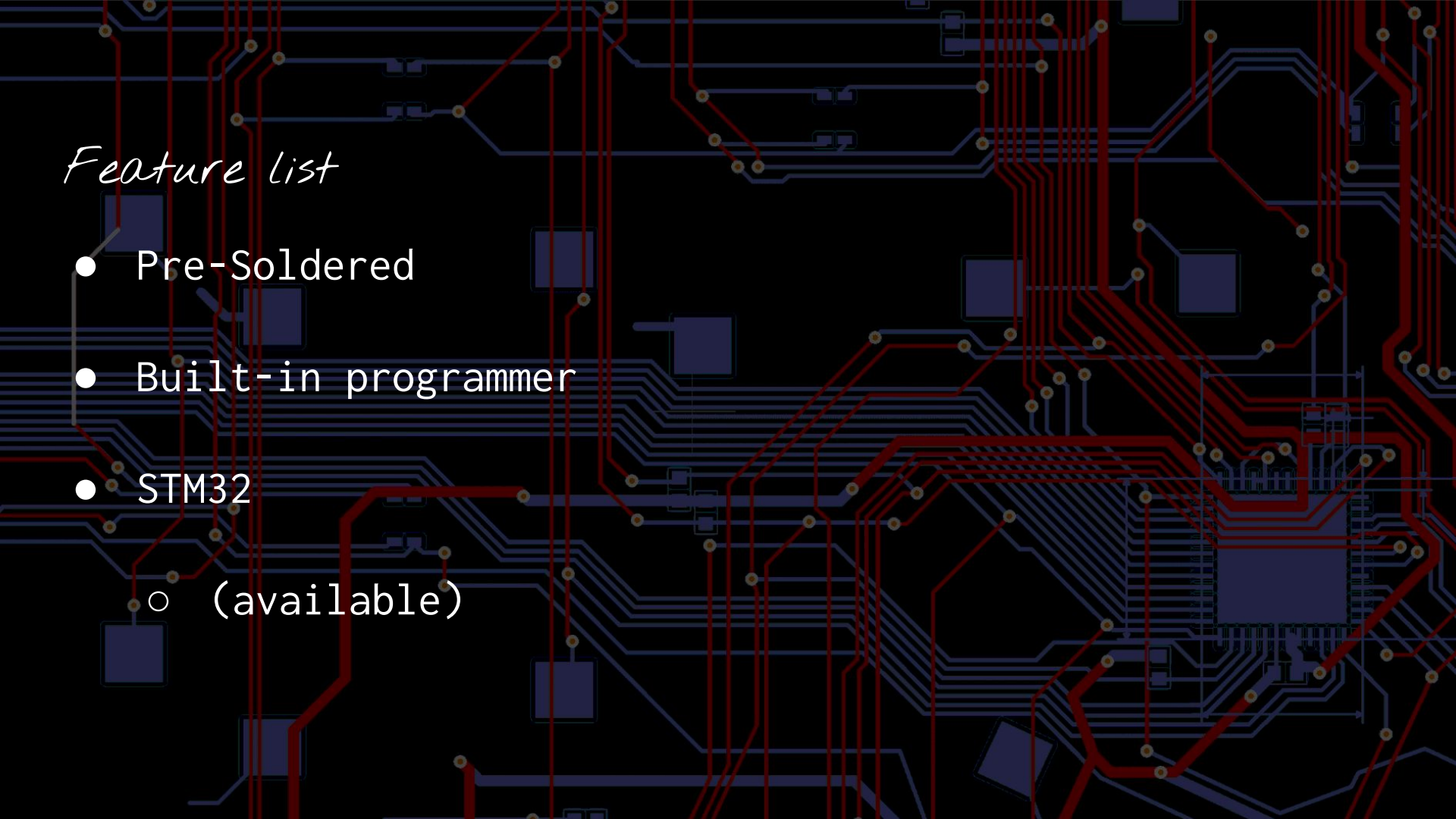
- Board Design
- Board Manufacture
- Bad programmer (component)
- Bad programmer (me)
- Bad chip
- Bad LED
- Misread Data Sheet
- Solder Bridge
- Over/Undervoltage
- QMK
- Angered Zeus
- ????




I gave up


(started over)


JP4
GND
R1
R2
D1
R9
R16
R17
R19
SWD
Nucleo
CN11
JP6
TX
RX
ST-LINK
NUCLEO
CN4
C4
C5
X1
C10
JP1
STLK_RST
R3
R4
C1
R5
R6
R7
D2
R8
U2
C2
R10
U1
USB_STLINK
CN2
T1
LD1
COM
GND
JP5
C3
R11
R12
R13
R14
R15
R18
LD2
R36
R20
C11
D3
D5
D4
U3
C7
C6
C8
U4
R24
C12
C13
C14
C9
R22
R21
C15
R23
R26
R29
C16
B1
USER
RESET
B2
R27
LD3
R28
LD4
R30
E5V
GND
C17
U5
C18
JP3
IDD
JP2
CHG
E5V
VIN
STLK
SB1
C20
C19
U6
C21
C22
IOREF
NRST
3V3
5V
GND
GND
VIN
POWER
CN6
MB1360C
www.st.com/stm32nucleo
C23
X2
R31
R32
C24
C25
X3
R33
R34
C26
U7
A0
A1
A2
A3
A4
A5
AIN
SB2
SB4
SB3
SB5
CN7
CN8
SCL/D15
SDA/D14
AVDD
GND
SCK/D13
MISO/D12
PWM/MOSI/D11
PWM/CS/D10
PWM/D9
D8
D7
PWM/D6
PWM/D5
D4
PWM/D3
D2
TX/D1
RX/D0
CN9
CN10



Feature list

- Pre-Soldered
- Built-in programmer
- STM32
  - (available)

Feature list

- Pre-Soldered
- Built-in programmer
- STM32
  - (available)

(hubris)

Feature list

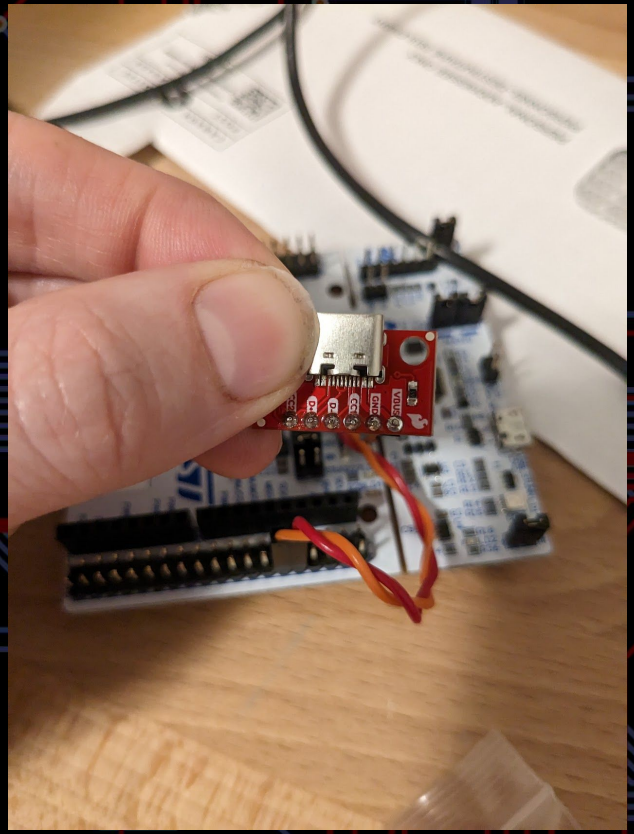
- Pre-Soldered
- Built-in programmer
- STM32
  - (available)

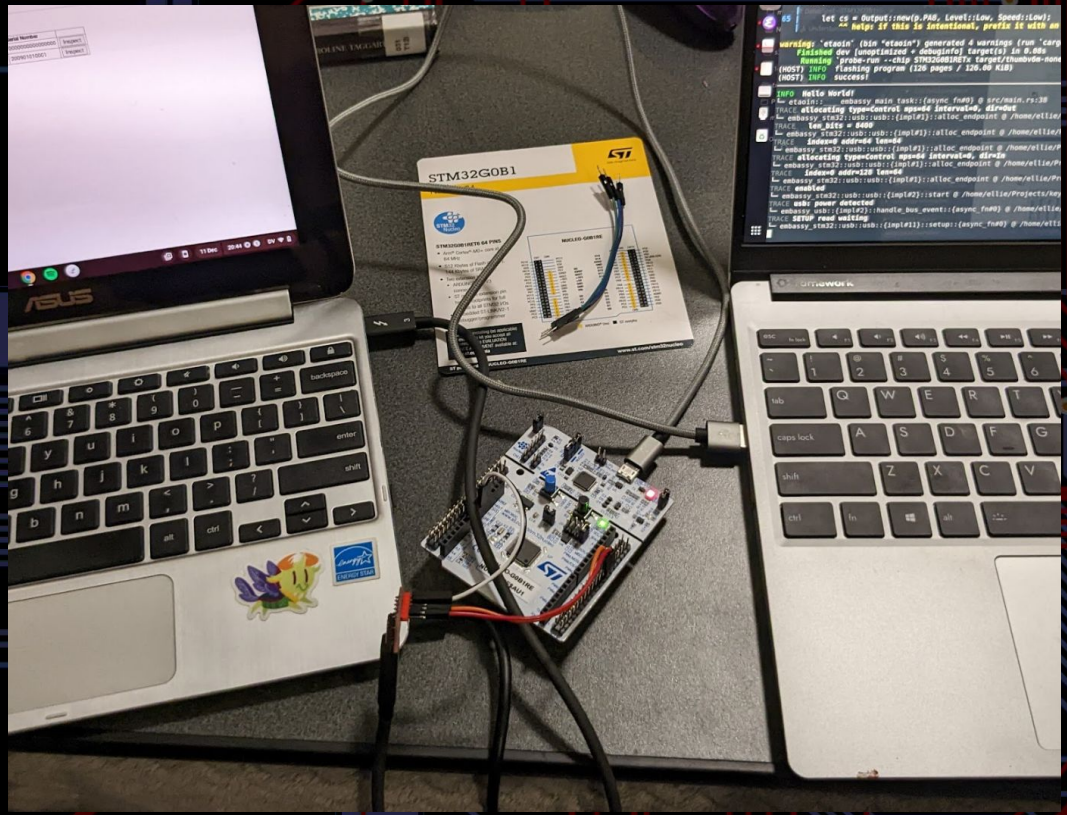
(not Hubris, the Rust RTOS)

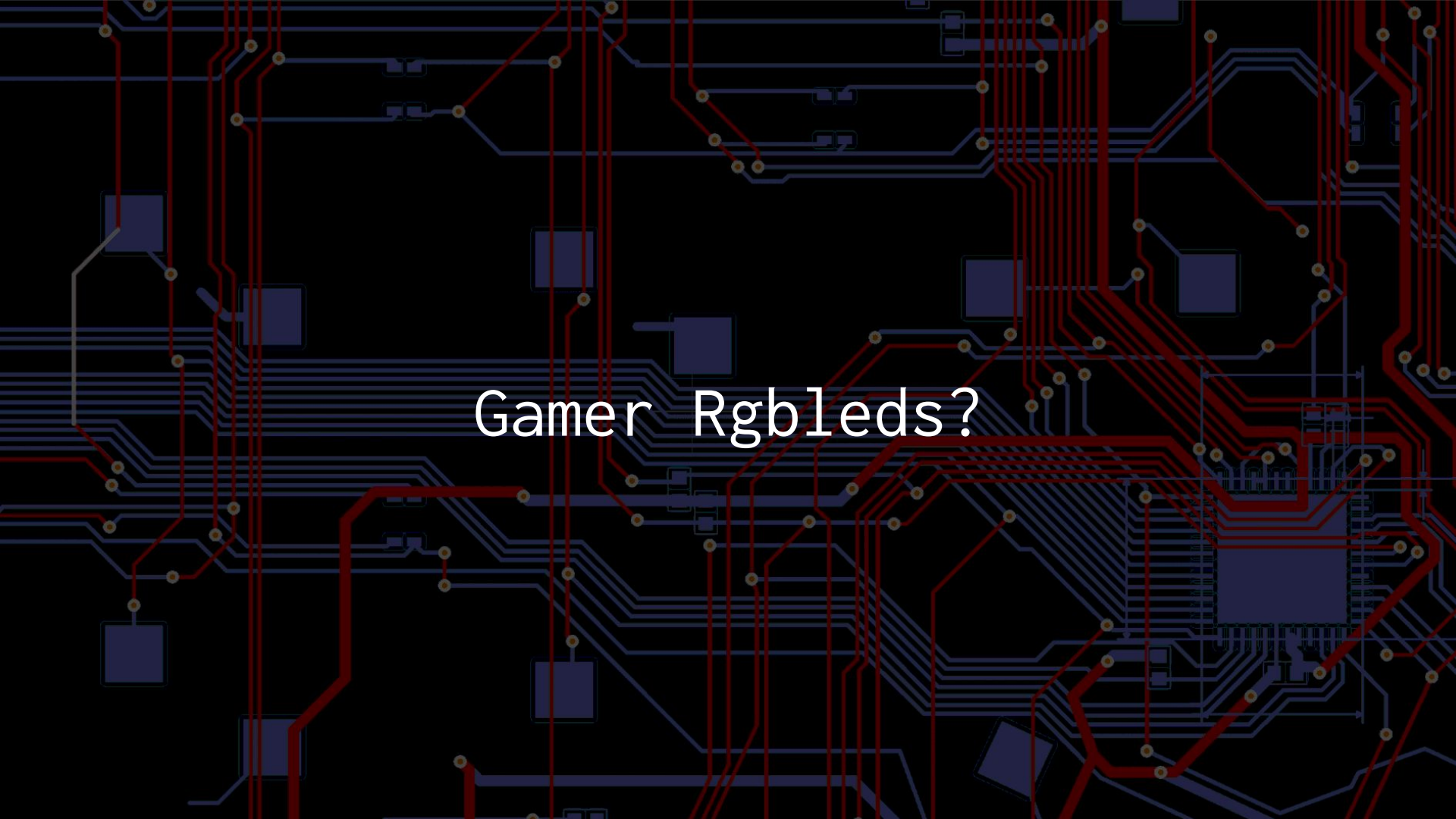
0xide

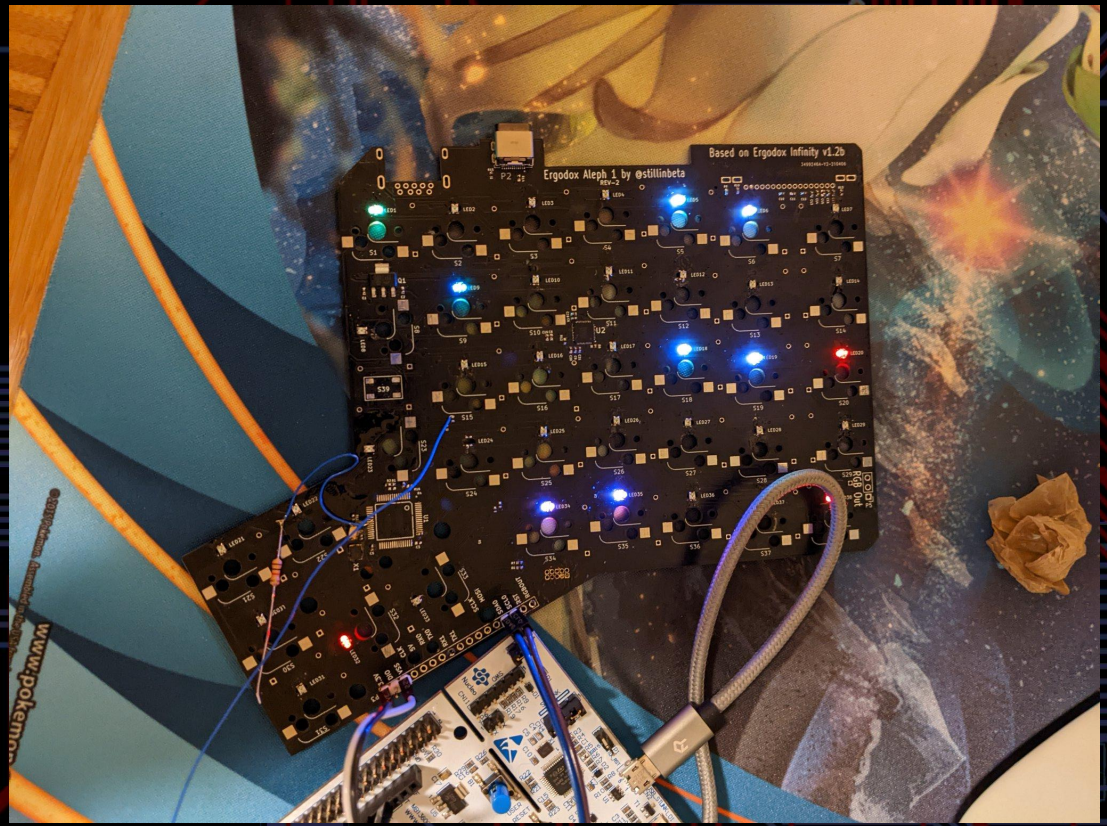
Unfeatures

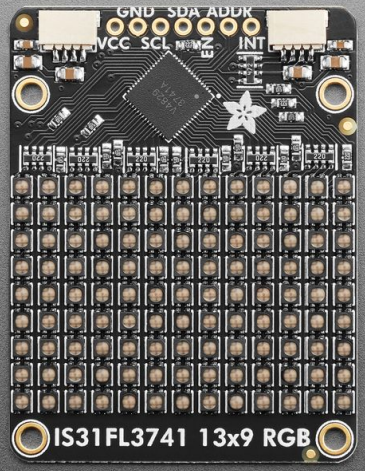
- USB Port

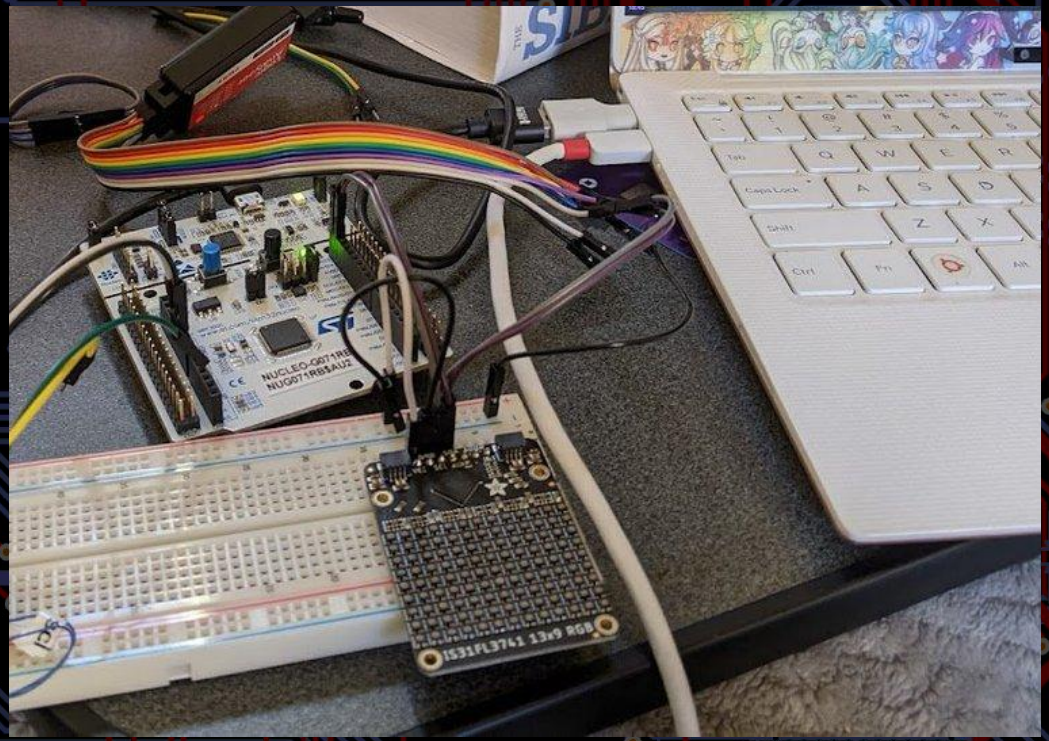


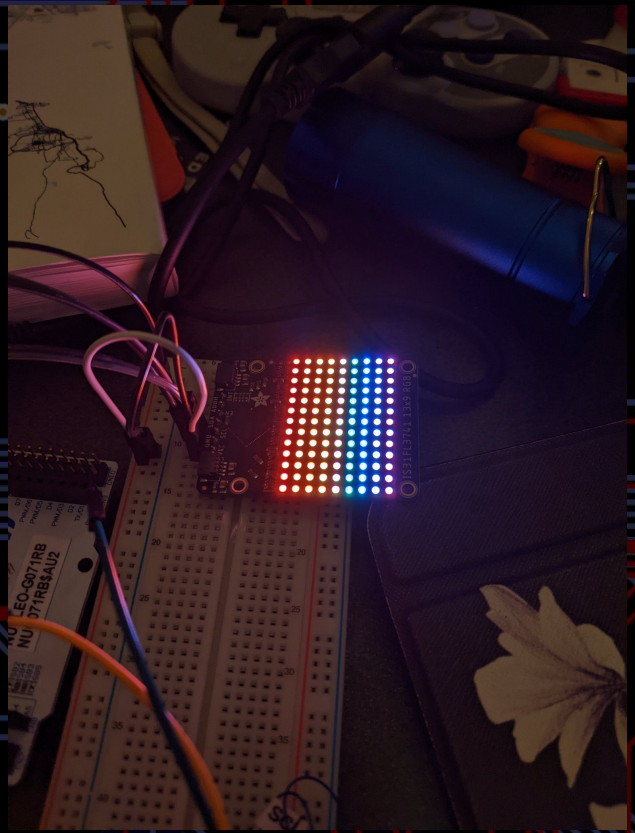

STM32G0B1
ASUS


Gamer Rgbleds?


Ergodox Aleph 1 by @stillinbeta
REV-2
Based on Ergodox Infinity v1.2b
RGB Out


GND SDA ADDR
VCC SCL INT
IS31FL3741 13x9 RGB

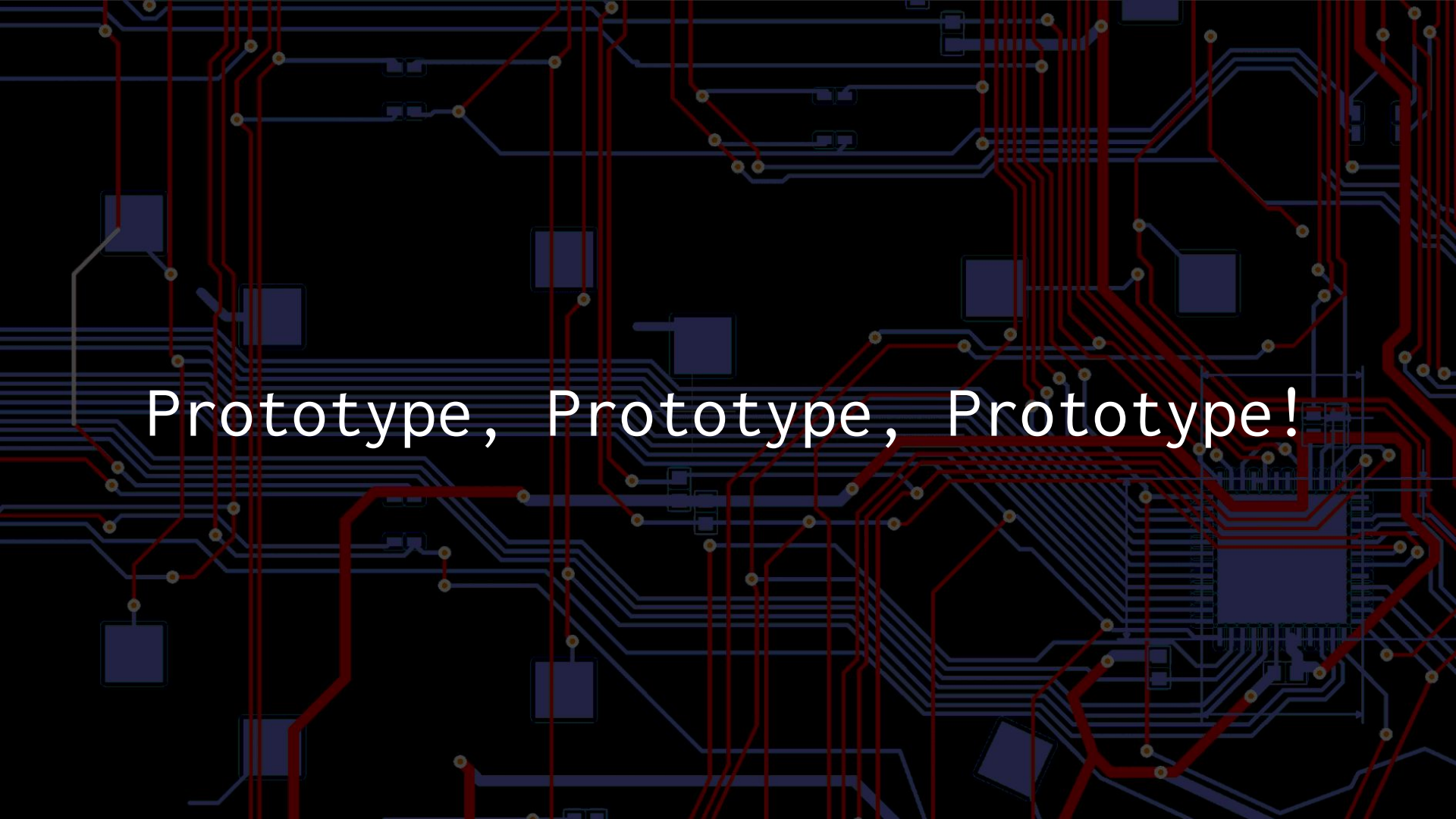

NUCLEO-G071RB
NUG071RBSAUZ
IS31FL3741 13x9 RGB

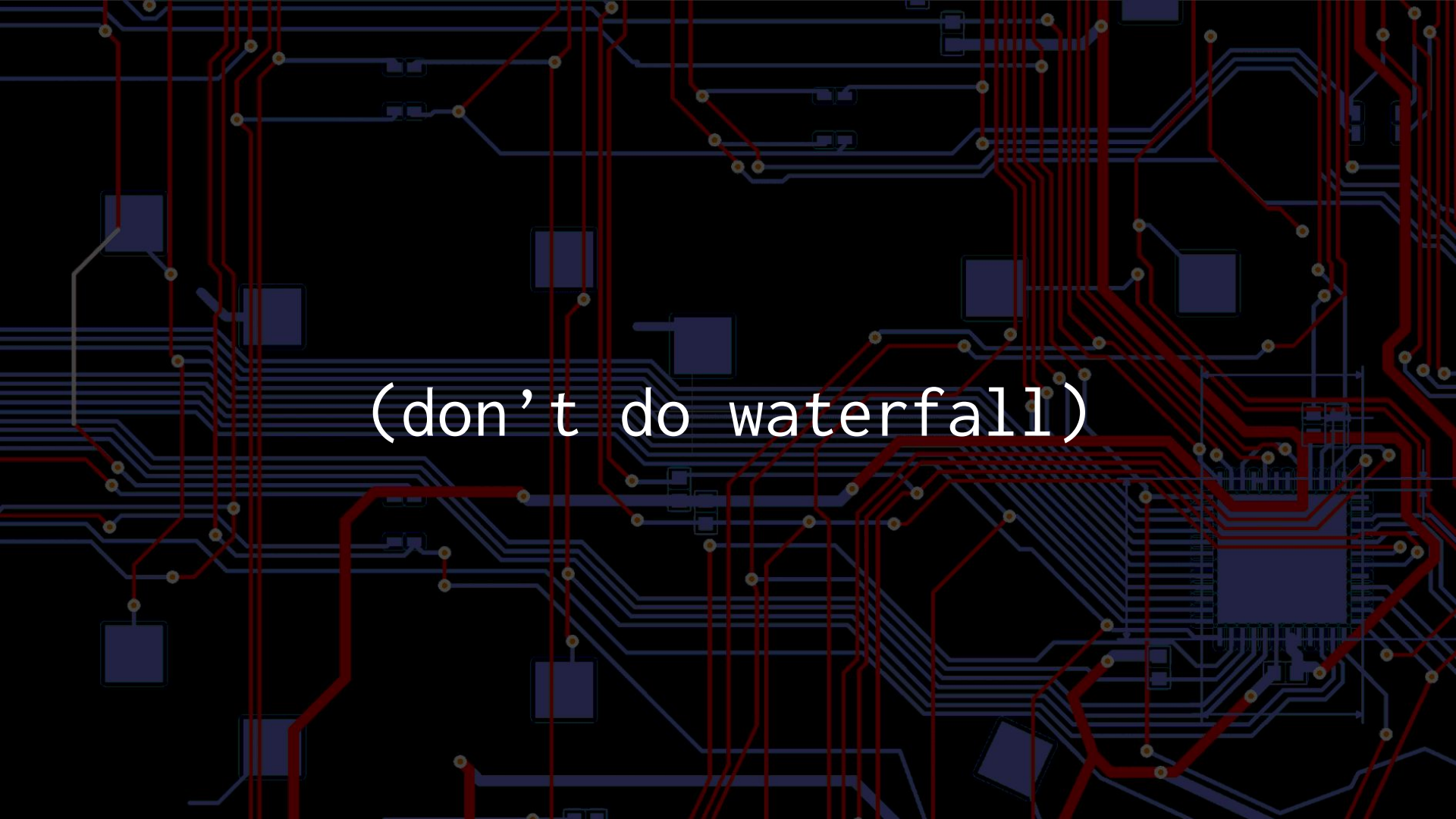


Depth-first Engineering

- I want to put these keycaps somewhere
  - I should get a mechanical keyboard
    - I should *build* a mechanical keyboard
      - How hard can PCB design really be
        - I'm sure I can learn to surface-mount solder
          - I2C can't be that complicated a protocol
            - C++ sucks let's do Rust
              - I've never written a driver but I bet I can do this
                - The library has a copy of a book on the USB protocol
                - (Slides won't let me indent anymore)

PCB DESIGN
ME
GETTING INTO KEYBOARDS
imgflip.com


Prototype, Prototype, Prototype!


(don’t do waterfall)

Thank you!

blog.stillinbeta.com

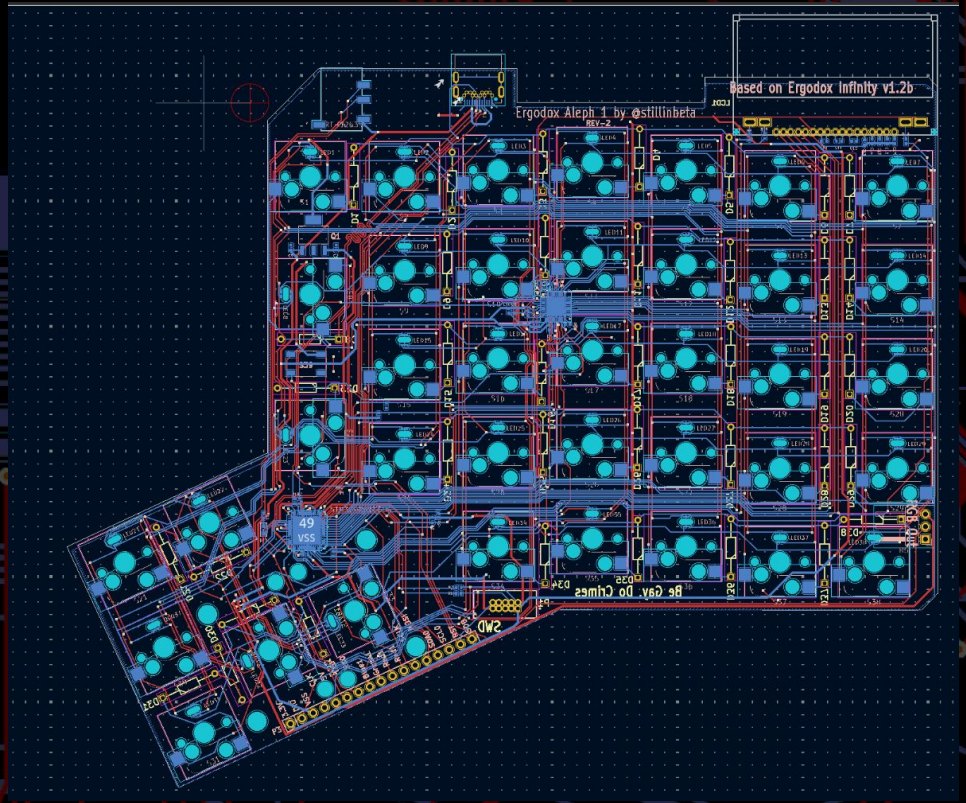
cohost.org/stillinbeta

liz@stillinbeta.com

@beta@gayhorse.club

Things that might be wrong.

- Board Design



Things that might be wrong.

- Board Design
- Board Manufacture

Things that might be wrong.

- Board Design
- Board Manufacture
- Bad programmer

Things that might be wrong

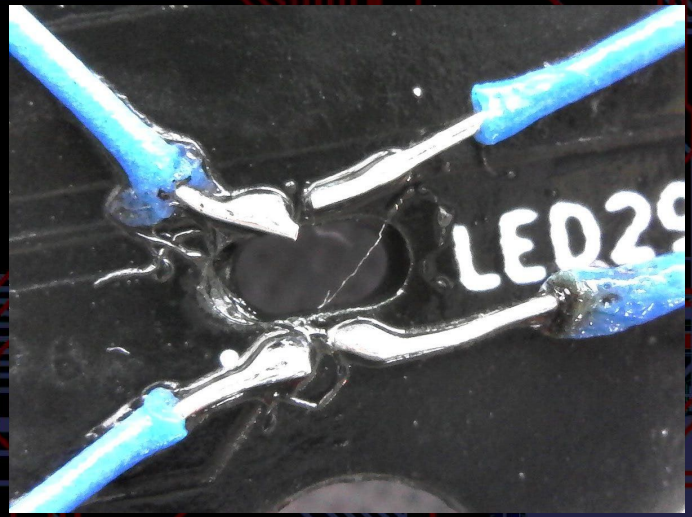
- Board Design
- Board Manufacture
- Bad programmer (component)
- Bad programmer

Things that might be wrong.

- Board Design
- Board Manufacture
- Bad programmer (component)
- Bad programmer (me)
- Bad chip

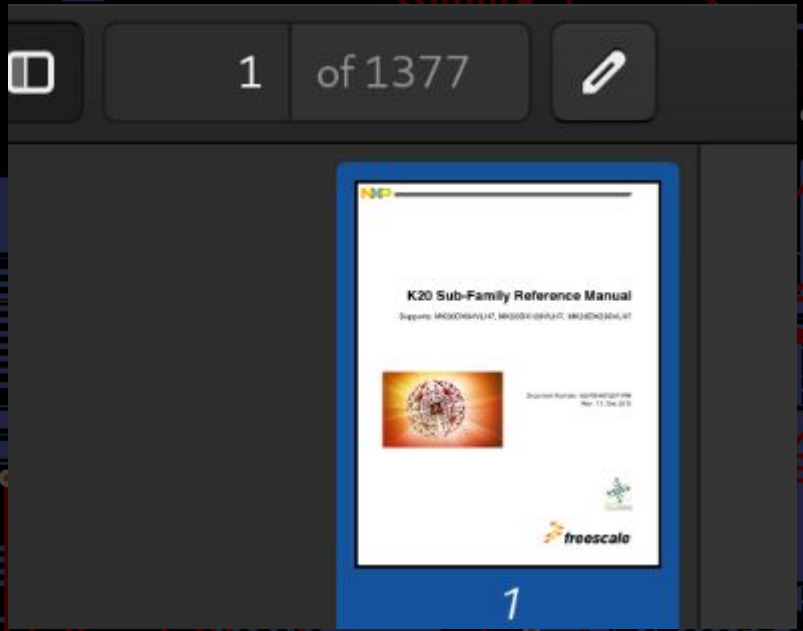
Things that might be wrong.

- Board Design
- Board Manufacture
- Bad programmer (component)
- Bad programmer (me)
- Bad chip
- Bad LED



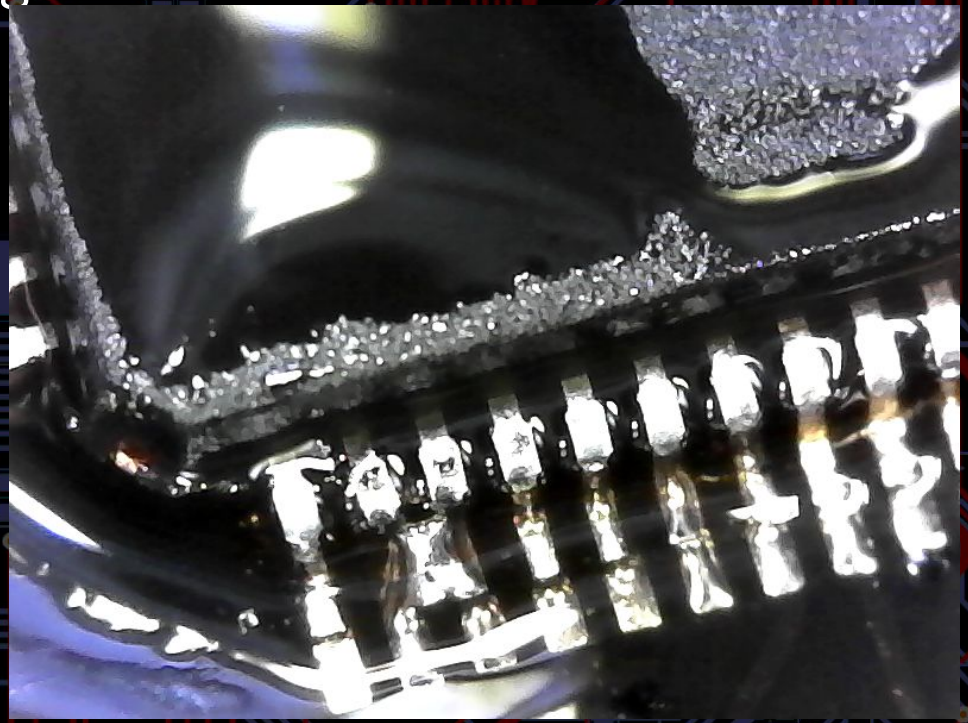
Things that might be wrong.

- Board Design
- Board Manufacture
- Bad programmer (component)
- Bad programmer (me)
- Bad chip
- Bad LED
- Misread Data Sheet



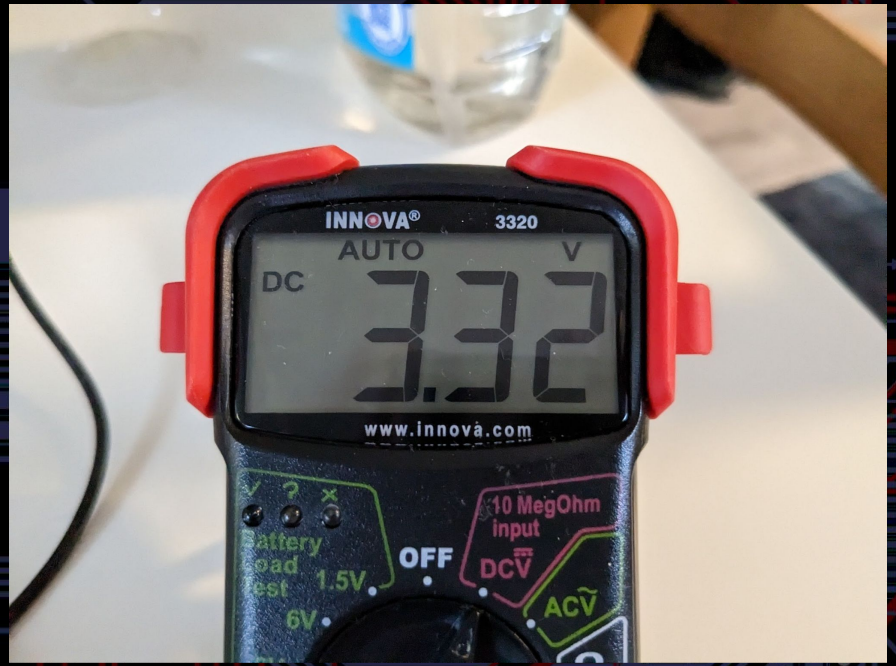
Things that might be wrong.

- Board Design
- Board Manufacture
- Bad programmer (component)
- Bad programmer (me)
- Bad chip
- Bad LED
- Misread Data Sheet
- Solder Bridge



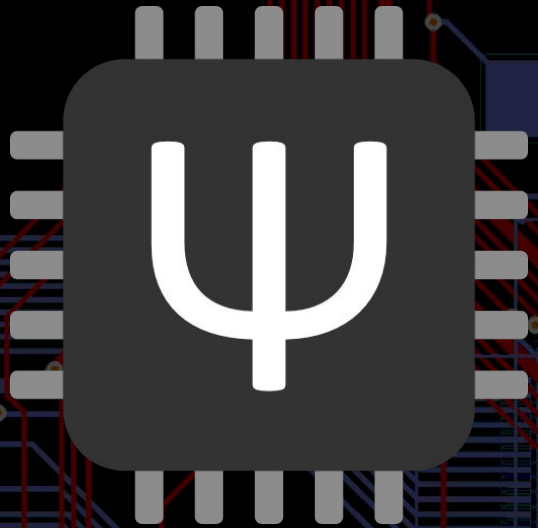
Things that might be wrong.

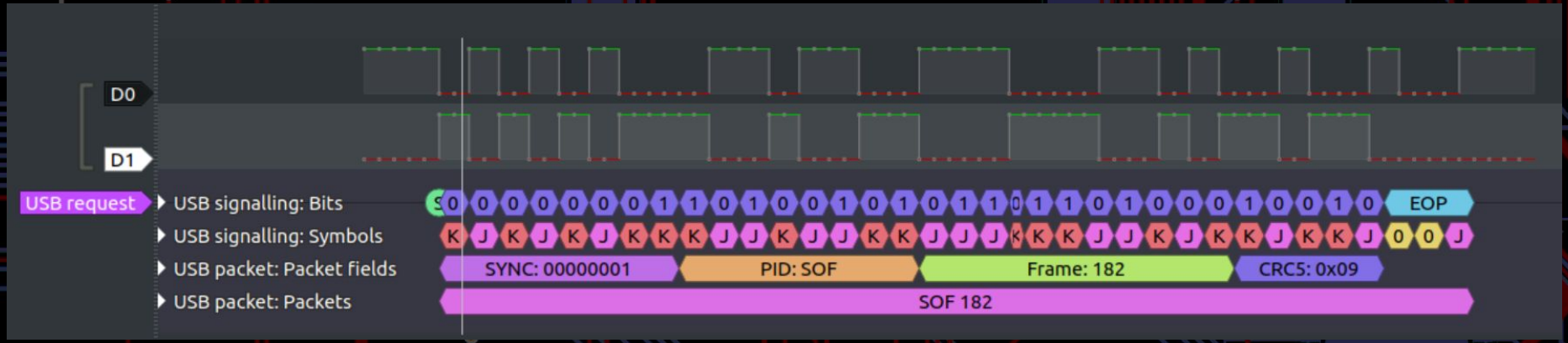
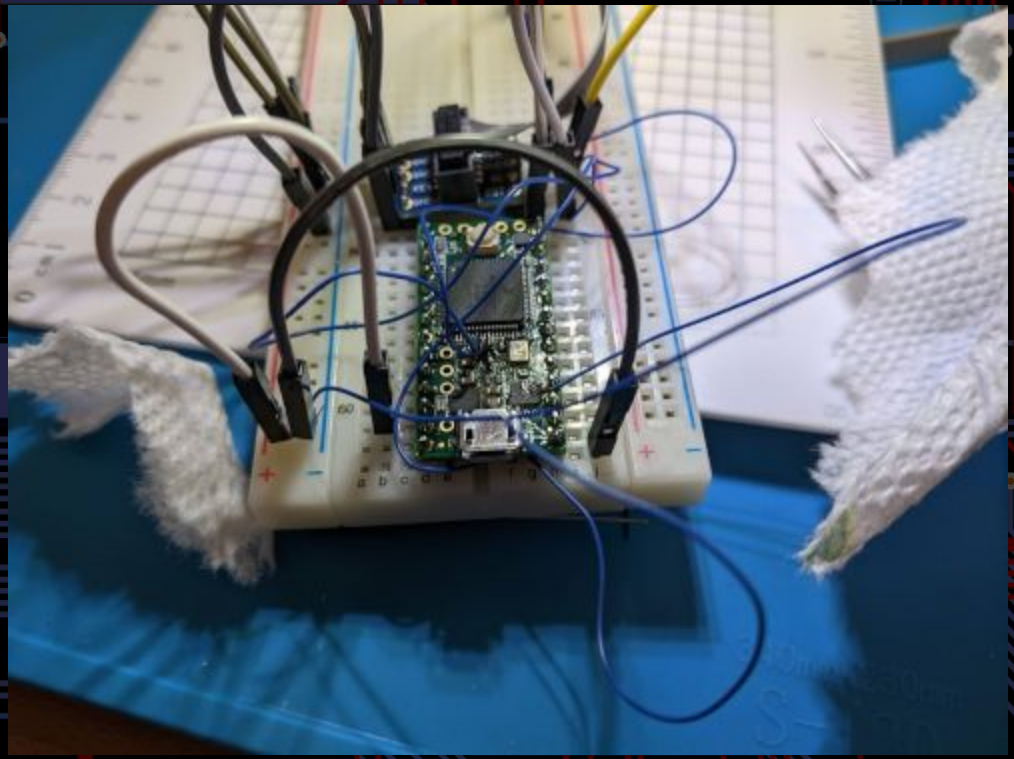
- Board Design
- Board Manufacture
- Bad programmer (component)
- Bad programmer (me)
- Bad chip
- Bad LED
- Misread Data Sheet
- Solder Bridge
- Over/Undervoltage



Things that might be wrong.

- Board Design
- Board Manufacture
- Bad programmer (component)
- Bad programmer (me)
- Bad chip
- Bad LED
- Misread Data Sheet
- Solder Bridge
- Over/Undervoltage
- QMK




D0
D1
USB request
USB signalling: Bits
S 0 0 0 0 0 0 0 1 1 0 1 0 0 1 0 1 0 1 1 0 1 1 0 1 0 0 0 1 0 0 1 0
EOP
USB signalling: Symbols
K J K J K J K K K J J K J J K K J J J K K K J J K J K K J K K J 0 0 J
USB packet: Packet fields
SYNC: 00000001
PID: SOF
Frame: 182
CRC5: 0x09
USB packet: Packets
SOF 182