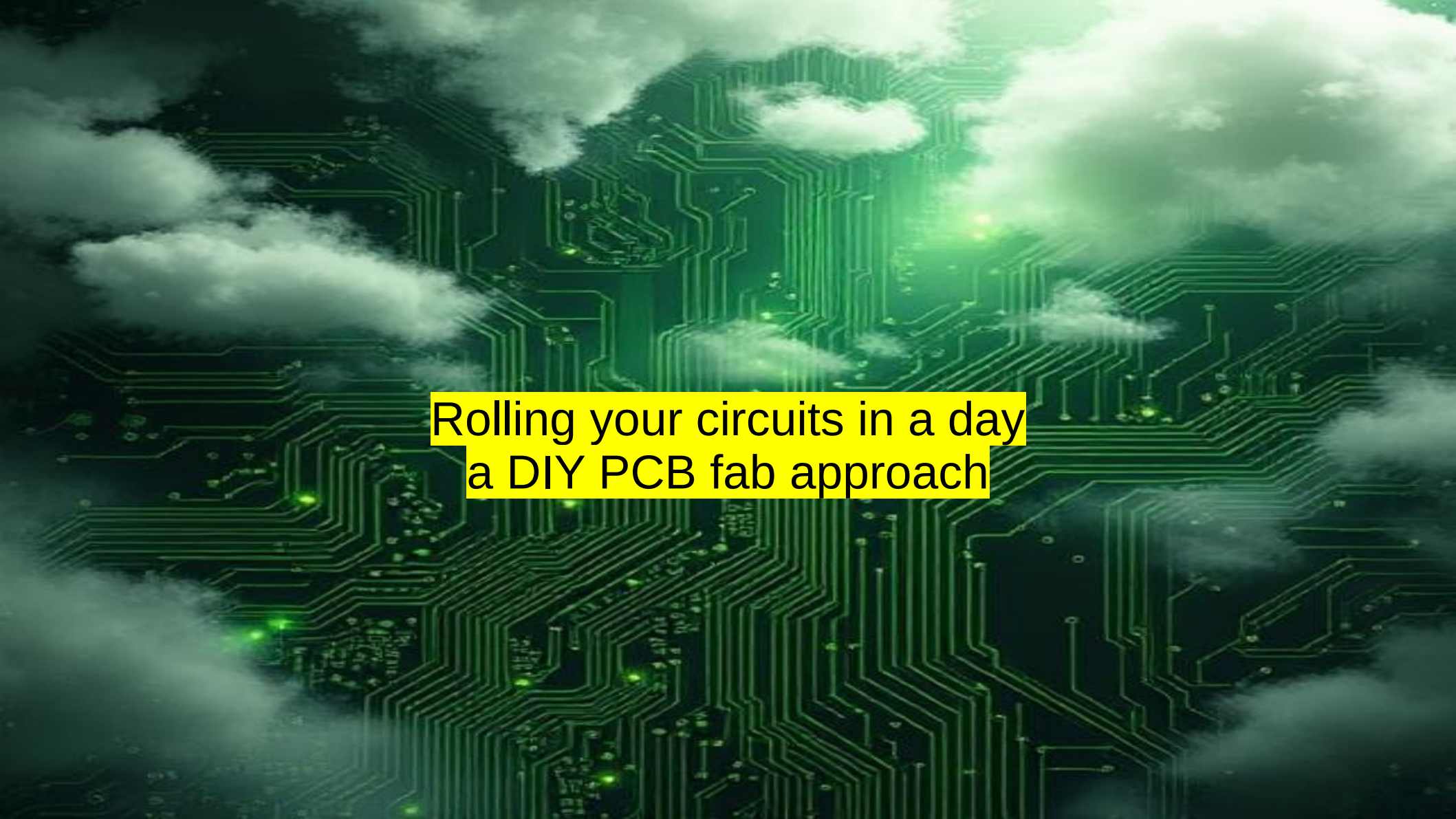


The background is a dark, textured surface overlaid with a complex, glowing green circuit board pattern. The circuit traces are intricate, with many small components and pads visible. Several points along the traces are illuminated with a bright green light, giving the impression of active electronics. White, fluffy clouds are scattered across the scene, some appearing to float above the circuitry, creating a surreal, ethereal atmosphere. The overall color palette is dominated by dark greens, bright greens, and white, with a black background.

Rolling your circuits in a day
a DIY PCB fab approach

Agenda

What makes up a PCB

Why DIY PCB's?

General overview of how I do it

Tools used

Alternative processes



whoami

Thomas

electronics hobbyist / write about it ->

Hackerspace.gent member

embedded software engineer

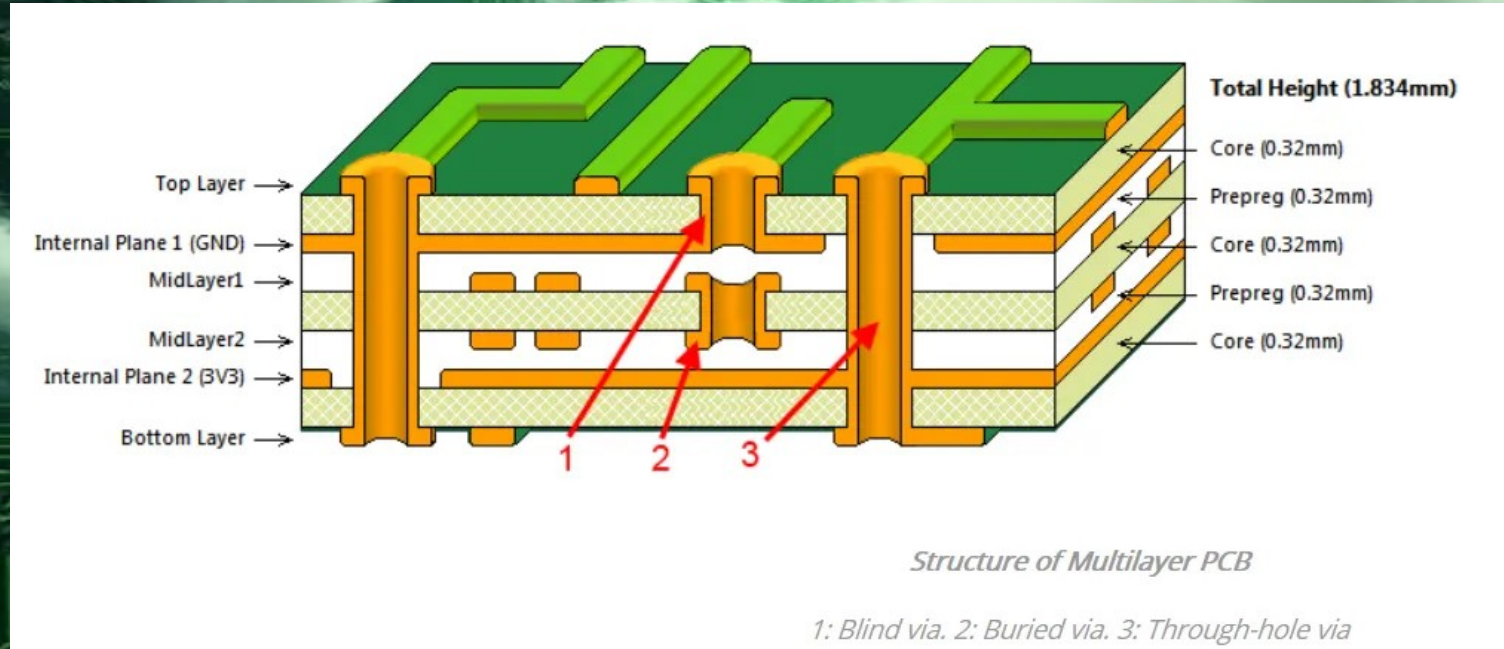
thouters.be

2020-04-26

About Me



What is a Printed circuit board



Pads
soldermask
copper
Silkscreen

through-hole plating
holes
Vias

Why DIY circuit boards

Why not

Prototyping advantages

Fast(er) detection of mistakes

The sheer craft of it

used to be cheaper than fabs

Some Chemicals

some equipment needed

some processes
precision / detail required

How I / Cut feedstock

Buy cut to size on AliXp → :(

Ironsaw

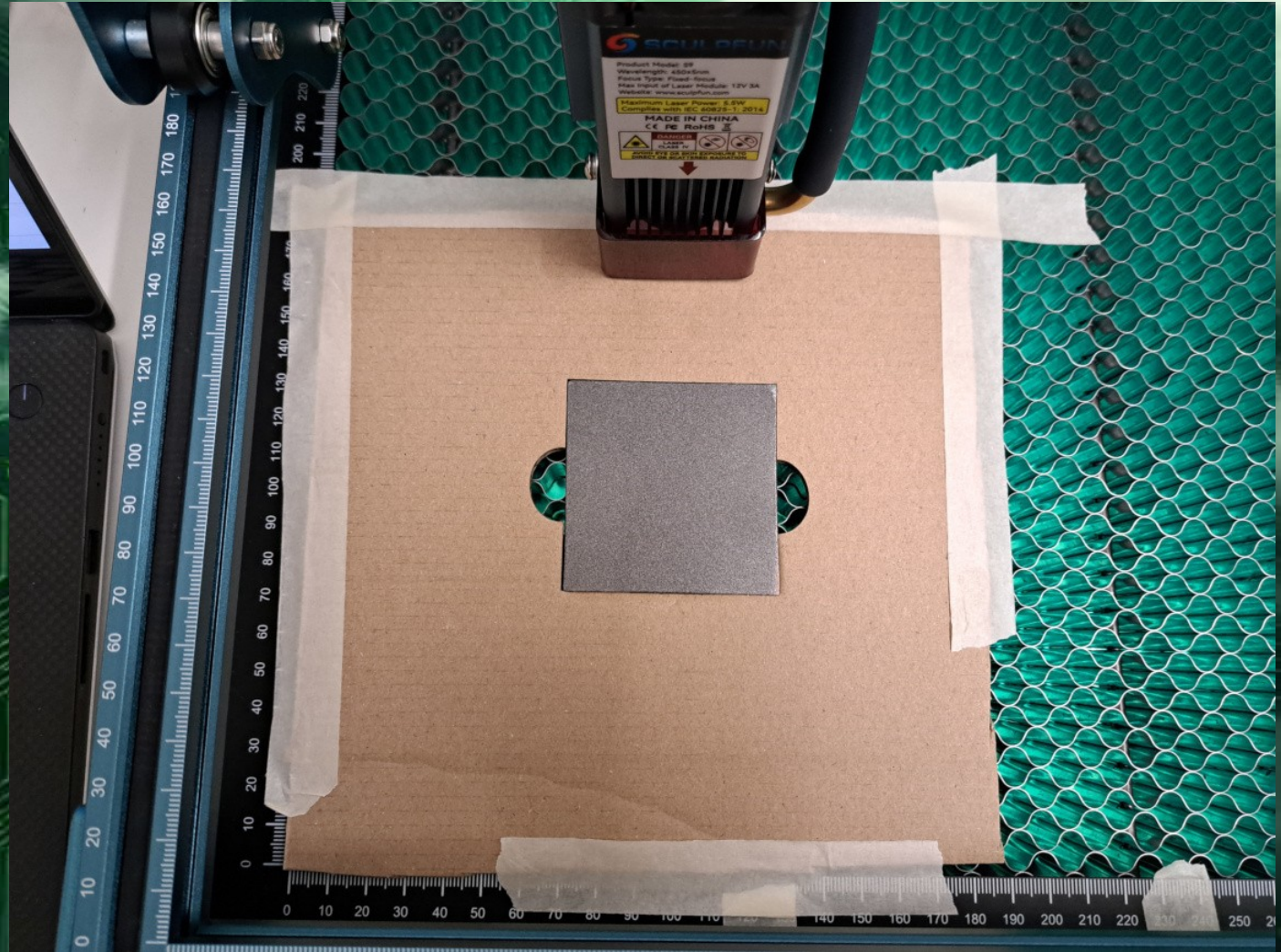
Acryl cutting knife



How I / Paint feedstock



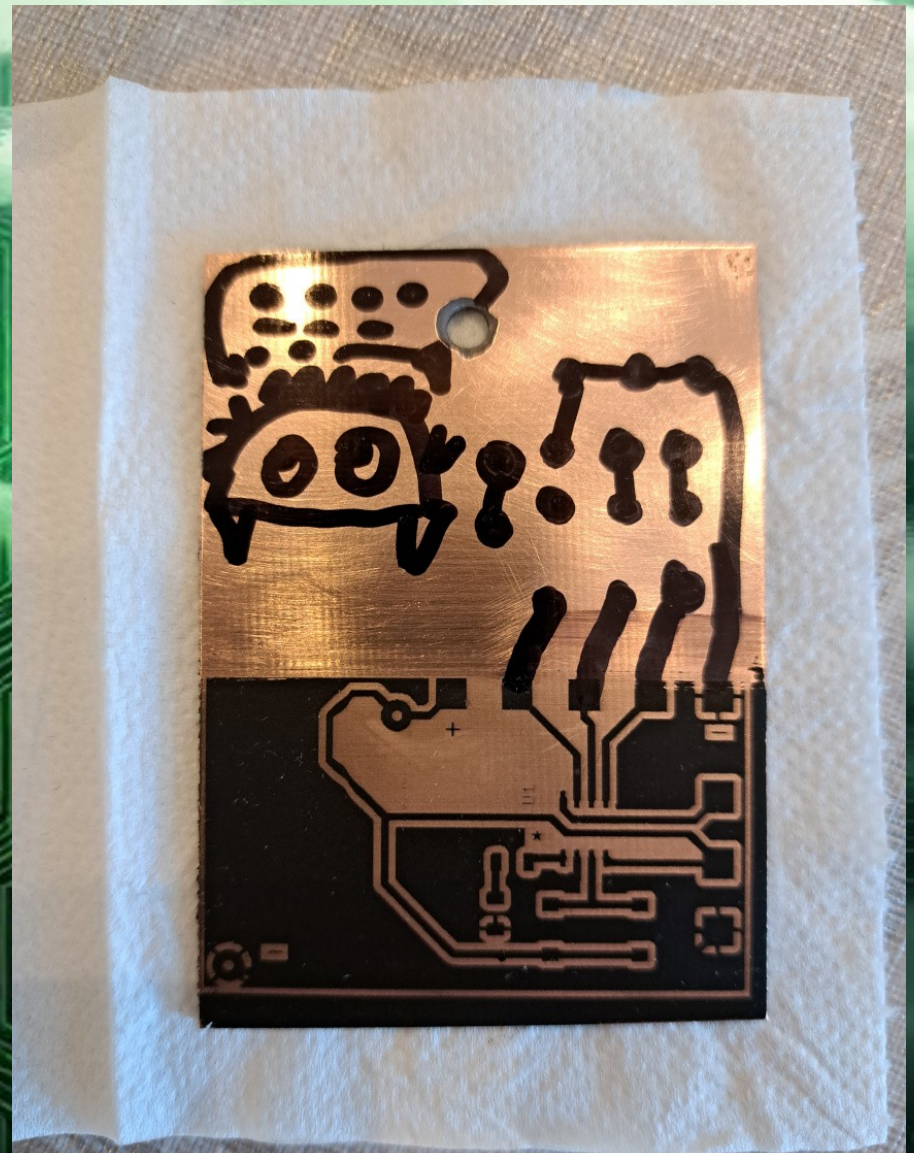
How I / mount the PCB in the engraver



How I / after engraving

Engrave front and back

draw on it using
permanent marker :-)



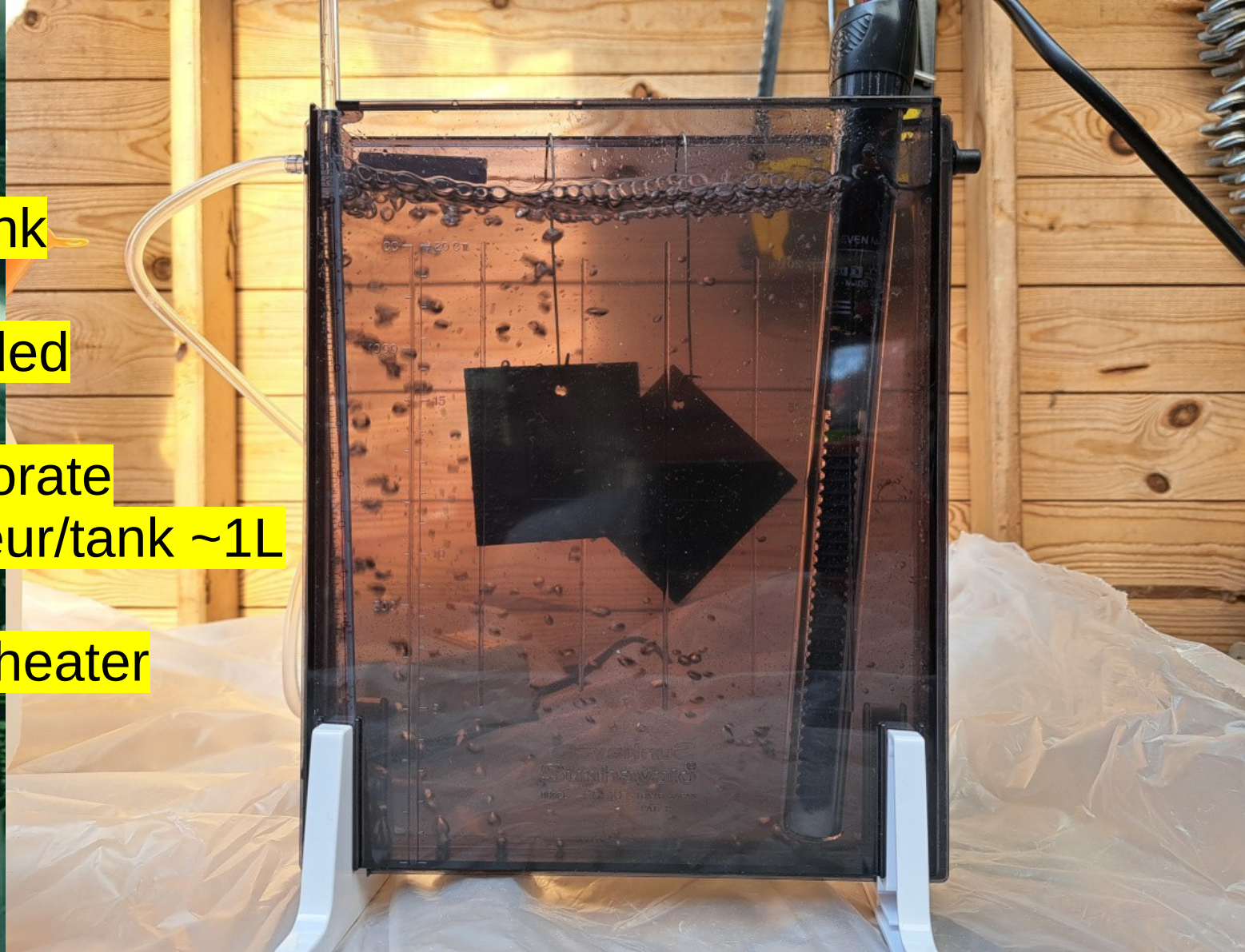
How I / etch

90's vintage tank

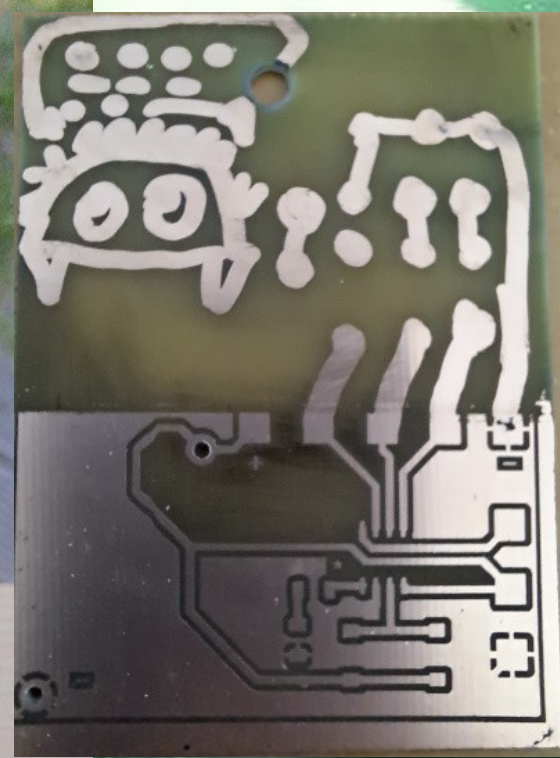
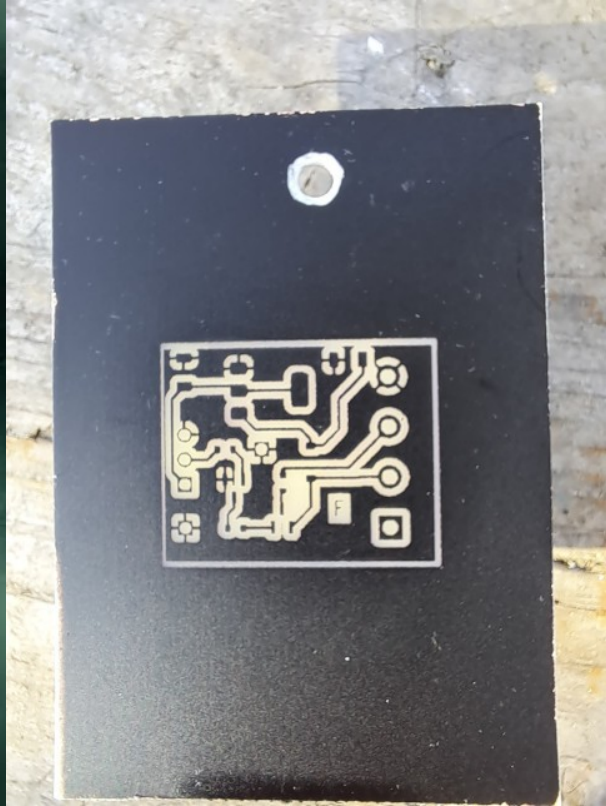
air pump included

Sodium perchlorate
€16/600gr – 8eur/tank ~1L

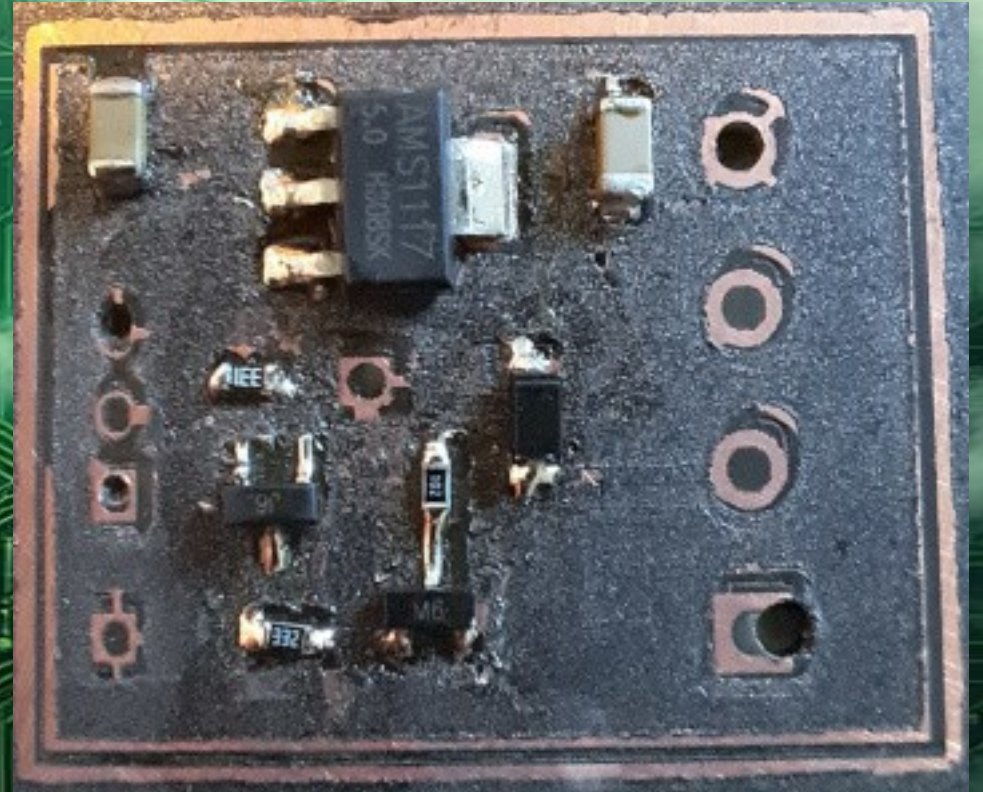
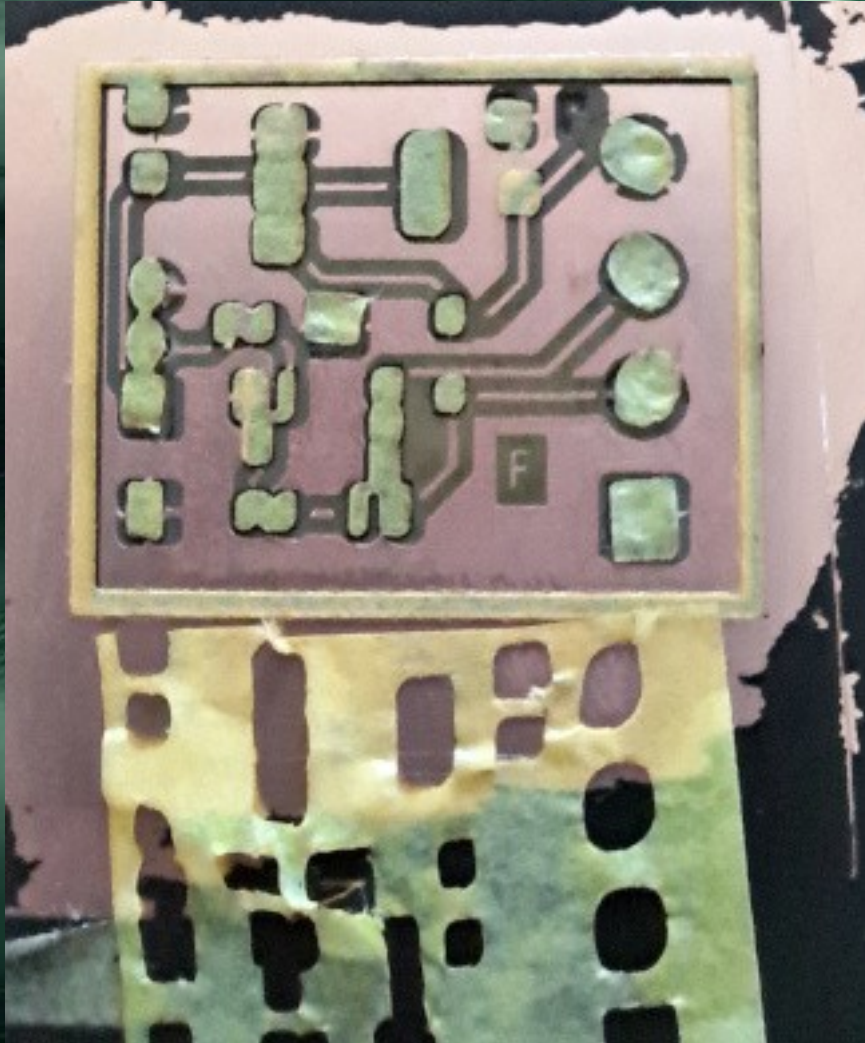
AliX aquarium heater



How I / after etching



How I / Soldermask experiments



First attempt with too thin traces/ too small pads
opaque high temp spray paint

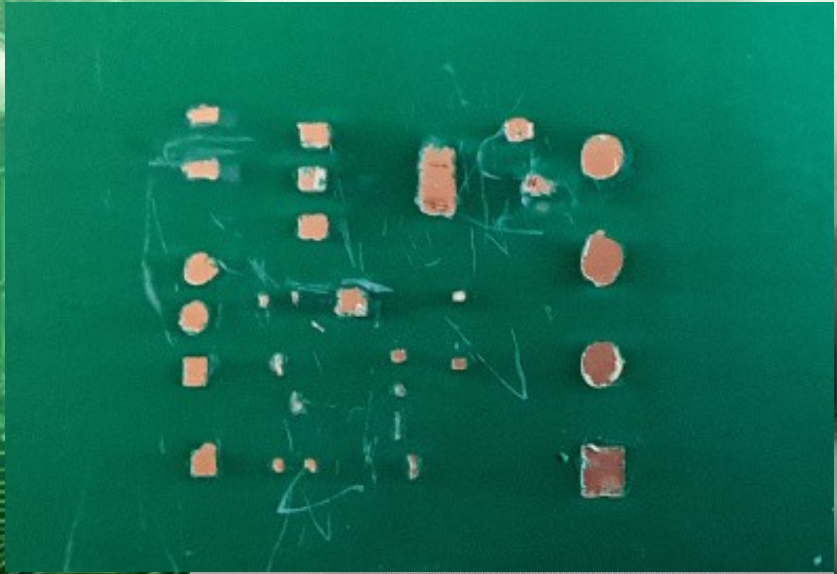
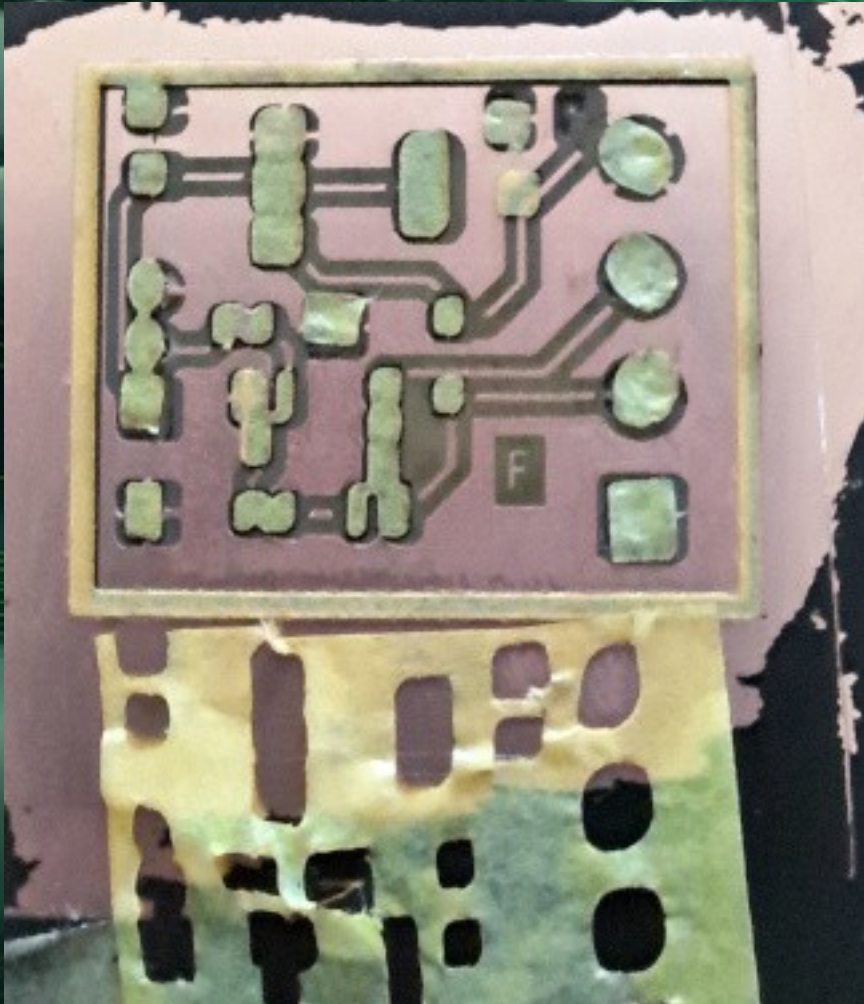
How I /Real soldermask paint



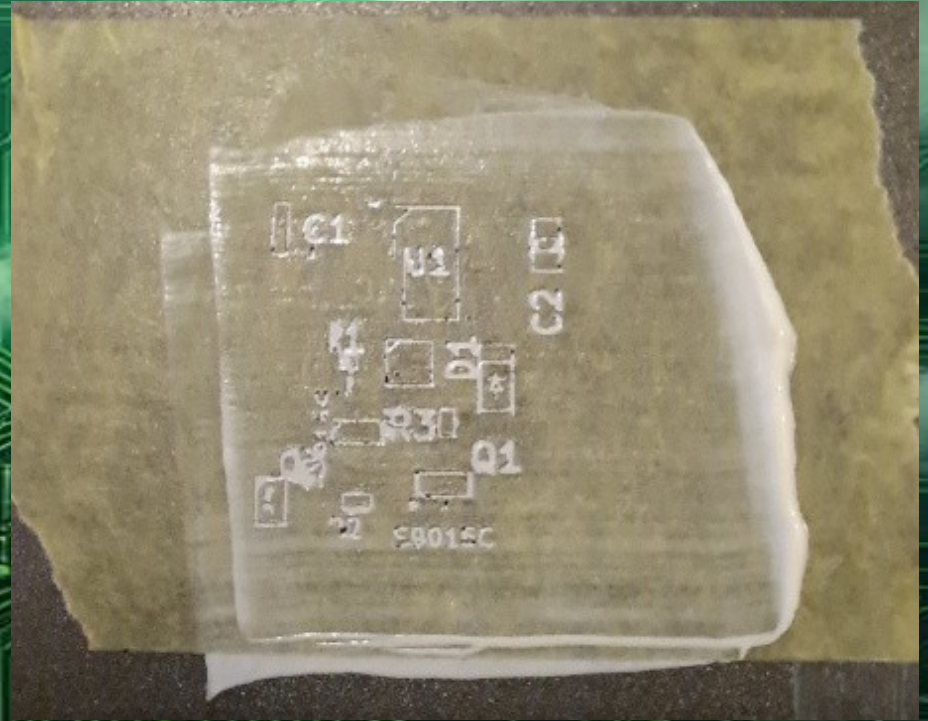
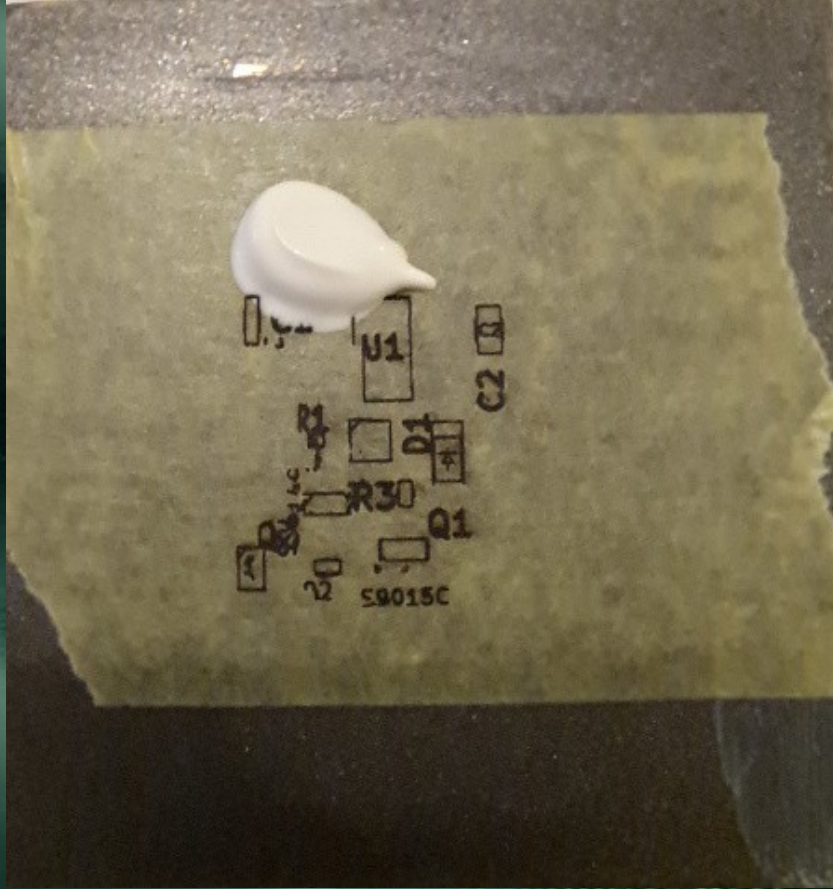
Soldermask curing



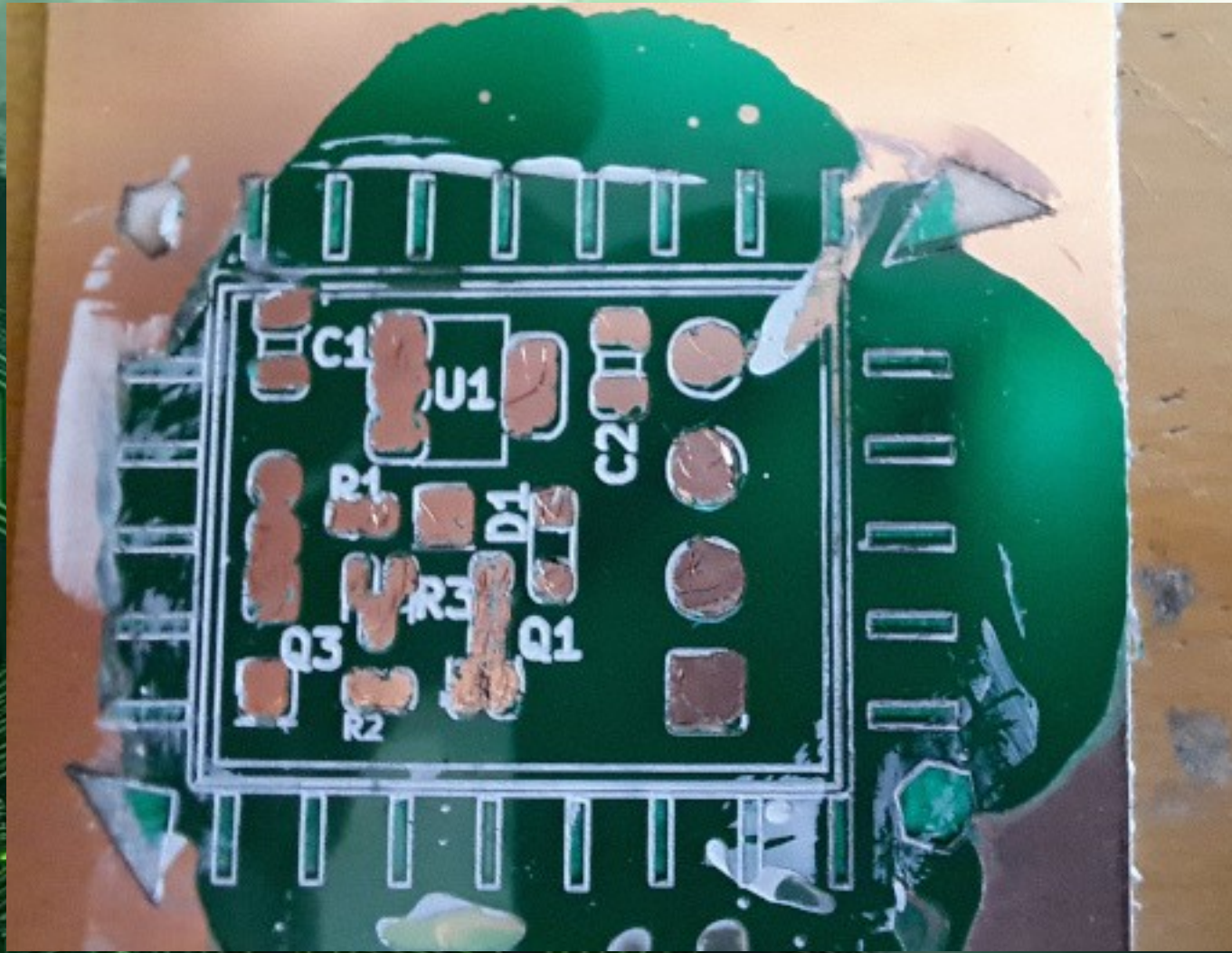
Soldermask experiments / tape mask / screen



How I / Silkscreen experiments



How I / experiments



Drilling



Summary

- Paint bare pcb board black
laser-expose copper layers
etch
remove black paint (IPA)
Apply soldermask + cure
laser clean pads
apply painters tape
engrave silkscreen
rub in paint + dry (and cure)
drill

Setup details / How it started

Sculpfun S9 + air assist

41cm x 41cm

230eur w/o compressor



Alternative hardware

CNC3018

=30cm x 18cm

~360? On ali?

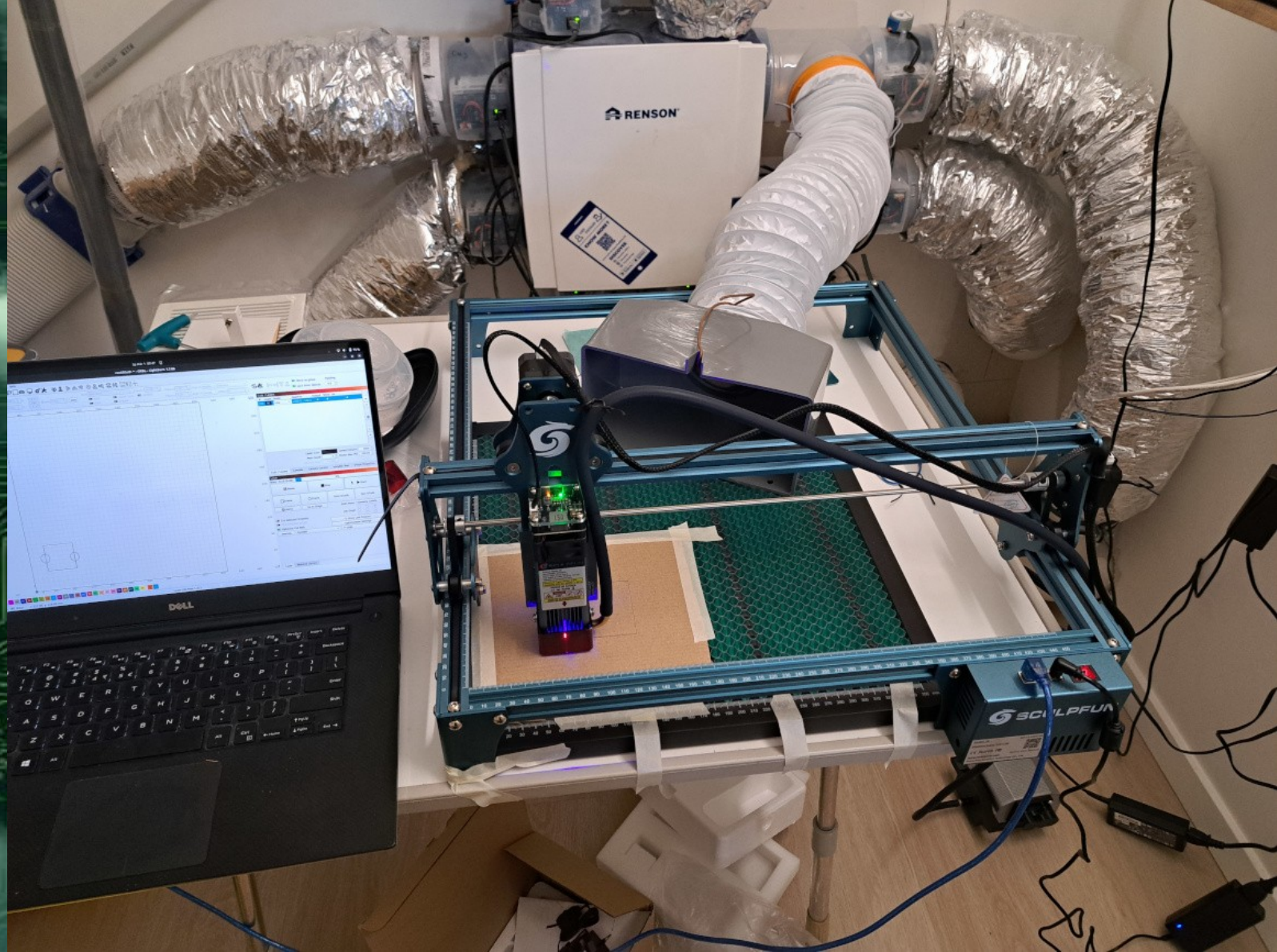
3018 PRO MAX

500W spindle

5.5W Laser



Setup details ventilation



Setup details: control + webcam

USB connection to
laptop

Ubuntu remote desktop
w/ lightburn

cvlc webcam server

Android VLC / mplayer
viewer

keeps eye on 3D printer too!



Setup details / laser

Absolute zero

cheap switch PCB's from AliXp

crimp JST connectors.

3d printed mount plate
([printables.com](https://www.printables.com))



PCB / KiCAD Design rules

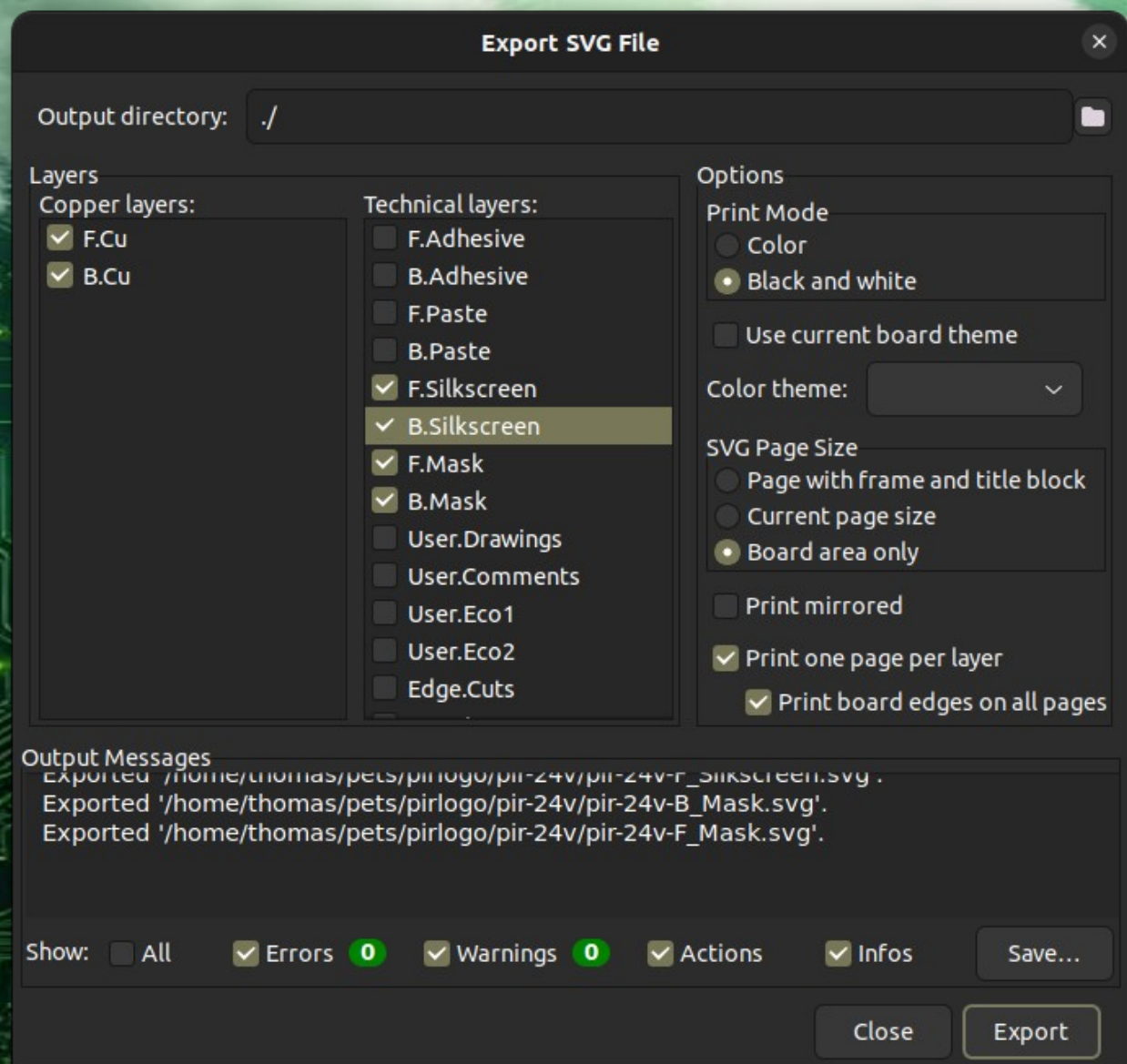
If possible, try to keep it single sided

Limit vias – jump tracks with SMD resistors

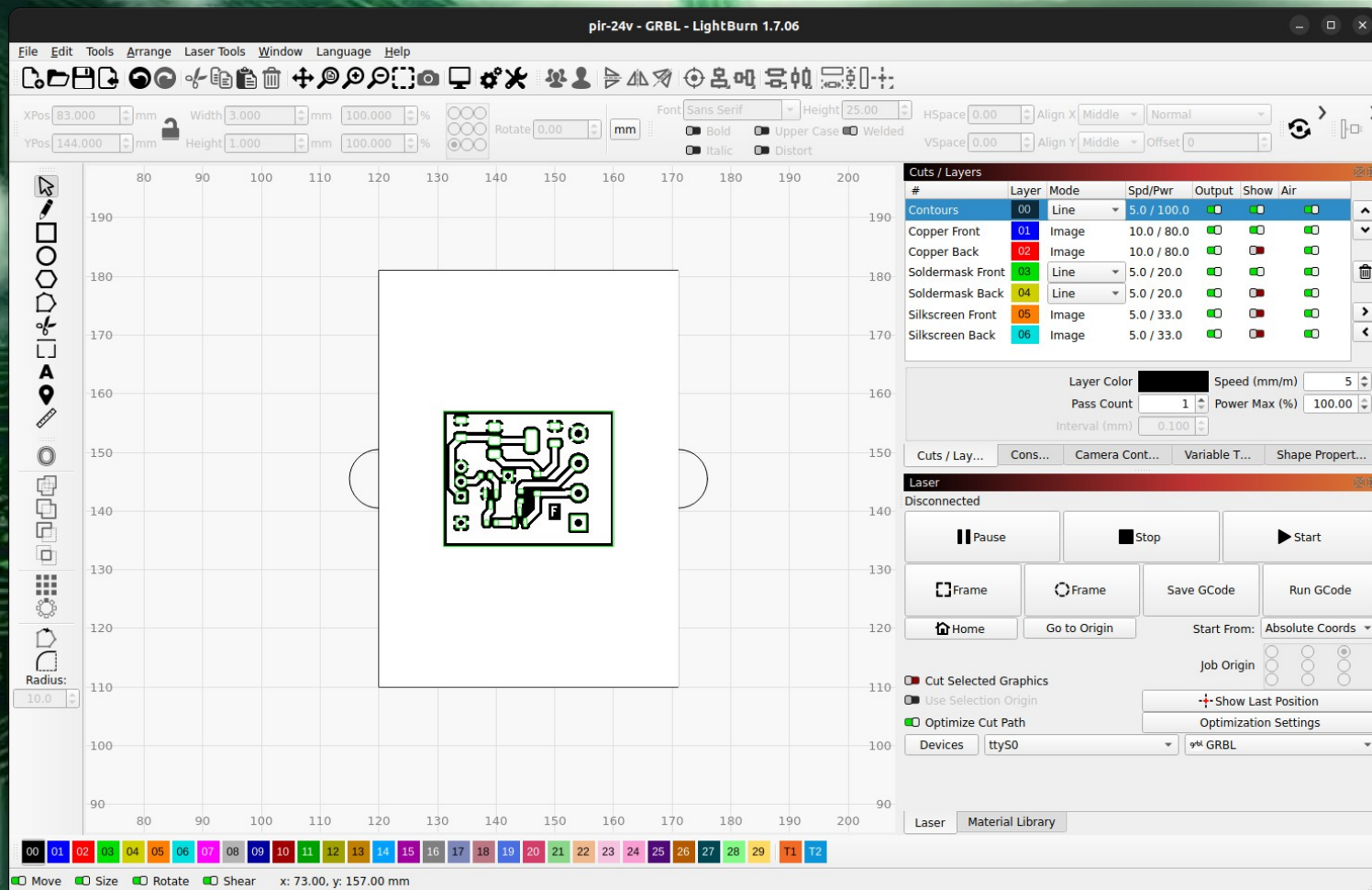
minimal trace width (etch resolution)

limit number of through hole components (manual drilling)

Setup details / KiCAD



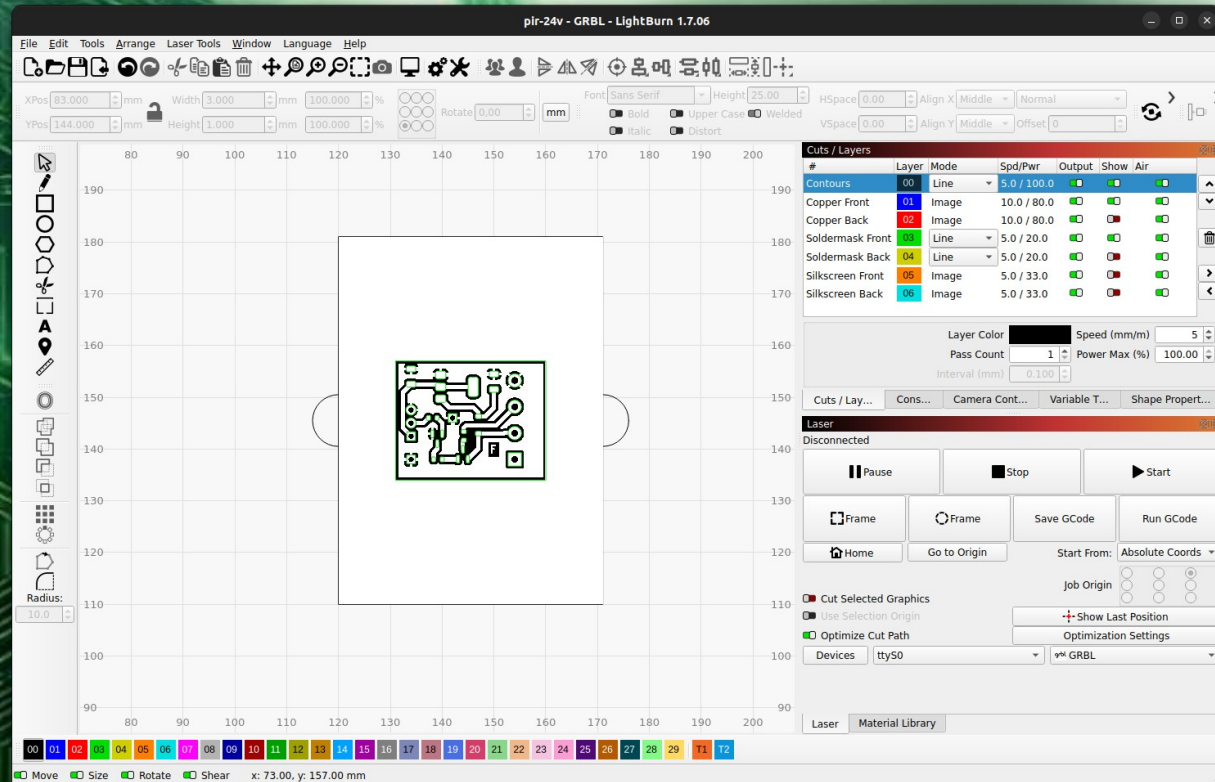
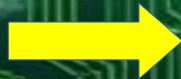
Laser project



Setup details / boardloom

lbrn-pcb-project.yaml > [] layers > identifier

```
1 project:
2   input_files_prefix: "pir-24v-"
3   output_name: "out.lbrn2"
4 board:
5   width: 51
6   height: 71
7   workarea_x: 80
8   workarea_y: 110
9 layers:
10  - board_contour:
11    handles_dia: 10
12    line_settings:
13      max_power: 100
14      speed_mm_sec: 5
15  - identifier: "F_Cu"
16    image_settings:
17      mirror_y: true
18      max_power: 80
19      speed_mm_sec: 10
20      dither_mode: "threshold"
21      line_interval_mm: 0.0847
22  - identifier: "B_Cu" ...
23  - identifier: "F_Mask"
24    center_on_board: true
25    line_settings:
26      max_power: 20
27      speed_mm_sec: 5
28  - identifier: "B_Mask" ...
29  - identifier: "F_Silkscreen"
30    hide: true
31    image_settings:
32      mirror_y: true
33      max_power: 33
```



Alternative processes of DIY PCB

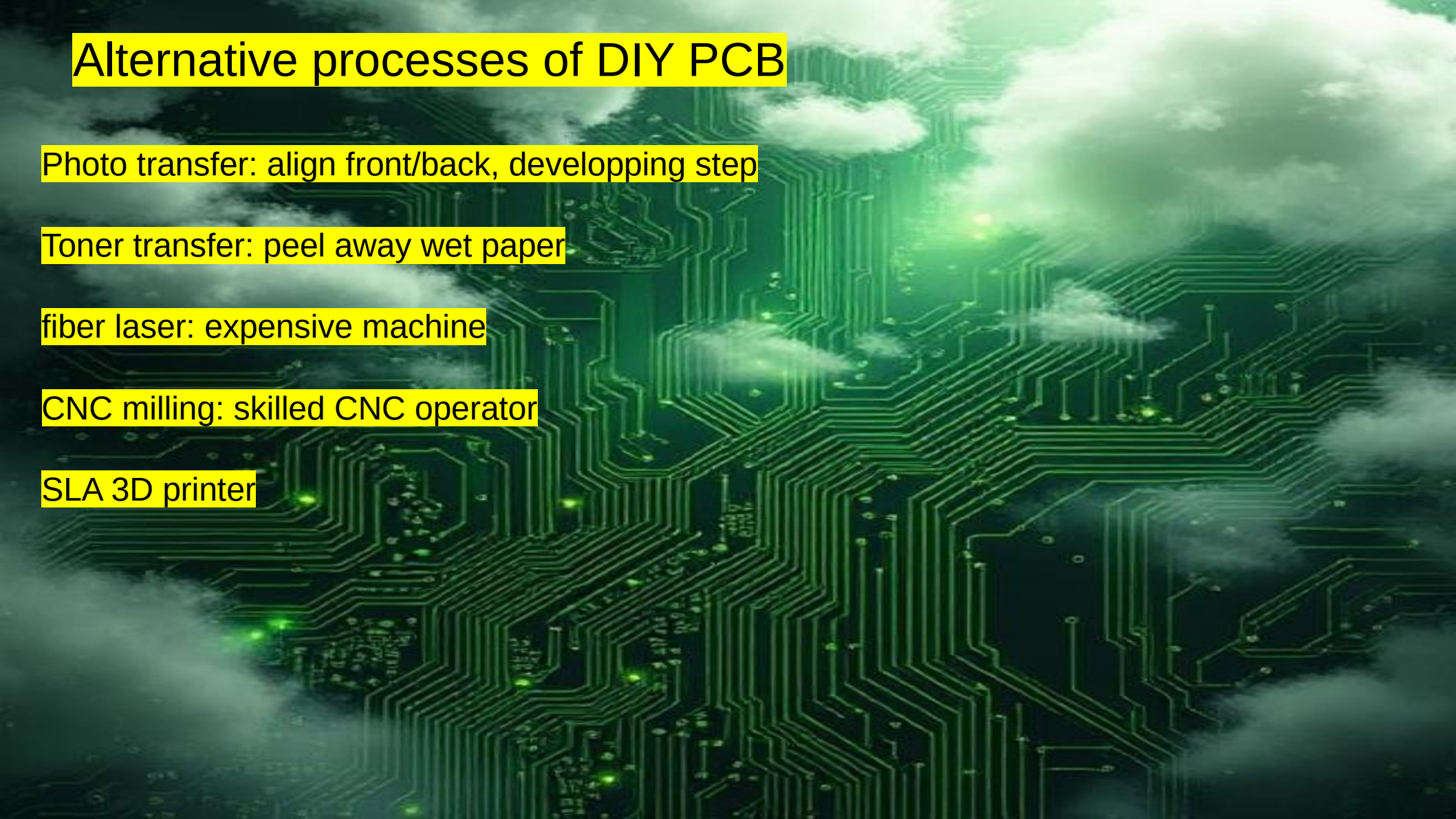
Photo transfer: align front/back, develop step

Toner transfer: peel away wet paper

fiber laser: expensive machine

CNC milling: skilled CNC operator

SLA 3D printer



Thank you!

Ideas to explore

Etch copper tape?

Screen printing other stuff?

funky pcb colors

funky silkscreen colors

