

# PCB design workflow example

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## Mount PCB for Somerville box

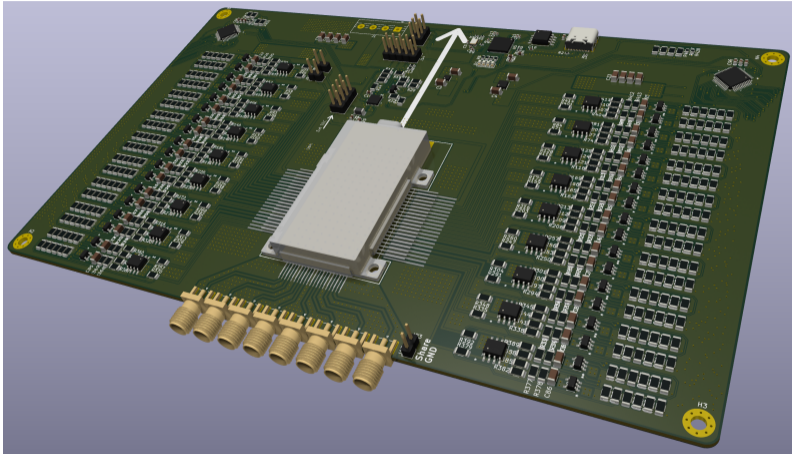


Figure 1: 3D rendering of the designed PCB using kicad 9.0

# Steps in PCB design and manufacture

- 1 Collect requirements and specs
- 2 Circuit design
- 3 Components selection
- 4 Creation of custom symbols/footprint
- 5 Schematic
- 6 PCB layout
- 7 Submission to manufacturer
- 8 Firmware development and testing
- 9 Go back to the step where you made some stupid mistake and reiterate the process



- Open source electronic CAD (ECAD, aka EDA)
- Targets only PCB design <sup>1</sup>
- Can be used as graphic frontend for ngspice (or other spice-like network simulators)
- Provides graphic and a python (socket-based) interface, especially useful to automate PCB layout
- Can generate 3D models of the final product

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<sup>1</sup>I'm sure it is potentially possible to extend its capabilities to chip design

# Collect requirements and specs

- Ask for the most detailed description, fill the gaps and feed back
- Once fixed do not change, if needed start over
- Make fewer assumptions as possible

# Circuit design and components selection

- Divide the circuits into functional blocks and find a topology that implement the target functionality.
- Select components depending on requirements and availability.
- Run simulations if possible/required.
- Always think about testing

In this presentation example:

- Somerville DC pad analog frontend (next slide)
- AD/DA conversion
- TEC control
- Controller

# Example: Analog frontend for Somerville DC pin

Each pin can be configured as:

- Voltage source, capable of driving 200mA,  $\pm 10V$
- Ground reference
- Ground reference with current sensing
- Transimpedance amplifier

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Configuration is done during assembly.

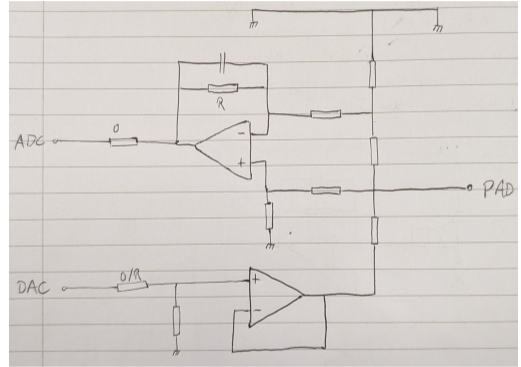


Figure 2: Schematic

# Creation of custom symbols/footprint

- The workflow of PCB design: schematic → DRC → layout → DRC
- In the schematic you place and connect symbols, documenting the functionalities.
- In the layout phase, footprints associated with the symbols are placed on the PCB, electrical connections are made using traces.

Symbols and footprints for lot of components can be found online, it is sometimes needed to make custom ones (e.g. somerville box)

- Organize the functional blocks to make it readable
- Comment to make design choices clear
- Put references to datasheet/images in case this helps
- Use the features offered by the software:
  - Hierarchical sheets
  - Net classes
  - Labels
  - Buses

- Make your life easier when laying out test areas
- Mind mechanical constraints
- Check on the manufacturer website what are the capabilities (minimum track width, minimum spacing, copper thickness. . . ) and set them on the software for correct DRC
- Add Wave Photonics logo and version information on it

# Submission to manufacturer

- (I'll do it next week)
- There are a lot, with a wide range of prices
- I'll not recommend one
- Some are specialized on mass manufacturing, other on small scale and precise assembly

# Firmware development and testing