

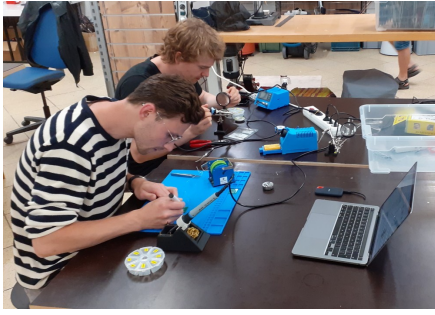
# KiCad Basics Tagebuch

## Teil 2. Samstag 25.06.22

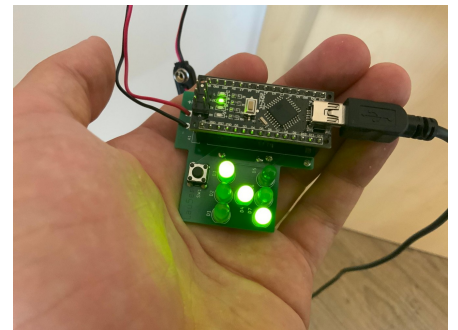
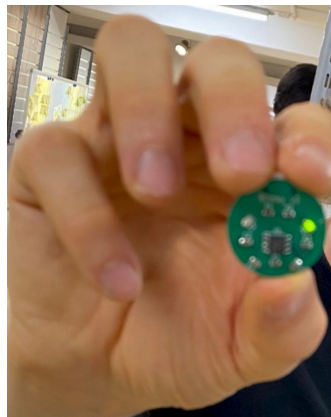
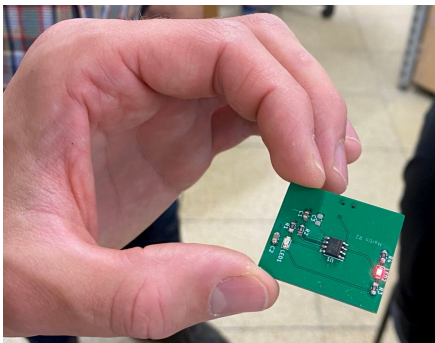
The boards were not completed during the first session. A deadline to complete the boards was set for the 13.06.22 to ensure that the boards would be back in time for part 2. The order was posted 11.06.22 and the boards arrived back 20.06.22 so in plenty of time for part 2.



We started the day with a commentary on the layouts and some of the things to watch out for. Steve then demonstrated his approach to soldering Surface Mounted Devices (SMD). The smallest part is 2mm x 1.27mm. Once the approach was demonstrated, they were left to assemble their boards.



Once assembly was completed, then it was time to test the work. All the boards worked without any issues.



## Things Learned and Improvements

The day went quite well. It was intended to be only a short session i.e. 2 hours and not as long as Part 1. Time-wise, it worked well and all were completed and packed up within 2½ hours. There is not much to consider to change in this case.

## Teil 1. Samstag 04.06.22

### Objective

There were two goals for the event.

- ## Method

The circuit diagram shows a PWR\_FLAG indicator using a TLC551CD timer. The timer is configured with the following components and connections:

- Power Supply:** A battery (BT1) provides power to the circuit. The positive terminal is connected to the VCC pin (pin 8) of the timer. The negative terminal is connected to GND.
- SW1 (SW\_SPDT):** A single-pole double-throw switch. One terminal is connected to VCC, and the other terminal is connected to the DIS pin (pin 7) of the timer.
- Resistors:**
  - R1 (10kΩ) is connected between VCC and the DIS pin (pin 7).
  - R2 (1MΩ) is connected between the DIS pin (pin 7) and the THR pin (pin 6).
  - R3 (200Ω) is connected between the OUT pin (pin 3) and the positive terminal of the LED indicator.
  - R4 (200Ω) is connected between the positive terminal of the LED indicator and the negative terminal of the LED indicator.
- Capacitors:**
  - C1 (300nF) is connected between VCC and GND.
  - C2 (100nF) is connected between VCC and GND.
  - C3 (100nF) is connected between the THR pin (pin 6) and GND.
- LED Indicator:** Two LEDs, D1 and D2, are connected in series. The positive terminal of D1 is connected to the OUT pin (pin 3) of the timer. The negative terminal of D1 is connected to the positive terminal of D2. The negative terminal of D2 is connected to GND.
- Timer Configuration:** The timer is configured with the following pin connections:
  - VCC (pin 8) to VCC.
  - DIS (pin 7) to VCC through R1 and to THR (pin 6) through R2.
  - THR (pin 6) to THR (pin 6) and to GND through C3.
  - CNT (pin 5) to GND.
  - GND (pin 1) to GND.
  - OUT (pin 3) to the positive terminal of the LED indicator.
  - RESET (pin 4) to VCC.

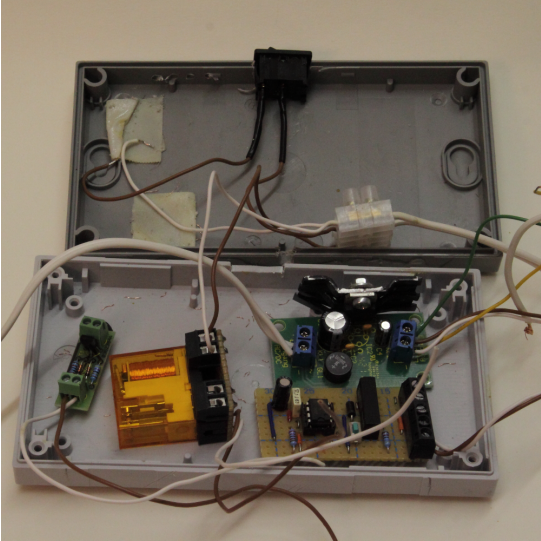
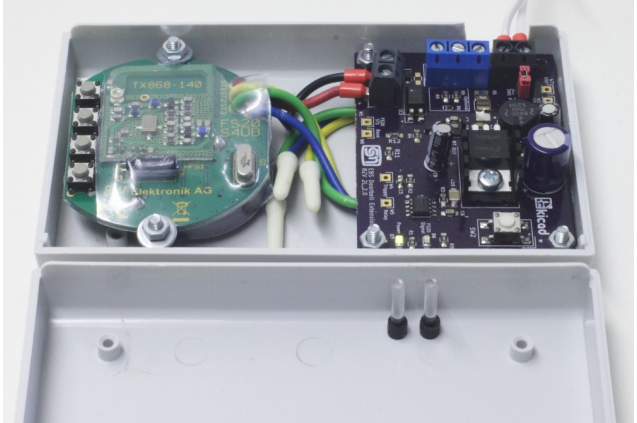
1. Creating a project.
2. Creating a schematic.
3. Creating and modifying the symbols for a schematic.
4. Assigning footprints to the symbols.
5. Creating and modifying the footprints.
6. Creating the layout.

# Procedure

I opened the session with the question of why do we want to create our own PCB? The answers that came back were consistent to what drew me into this area of electronic development.

- DIY home automation.
- Neatening up existing projects.
- Wanting to interface neatly with existing development boards.
- Create my own development board.

I showed my own example of neatening up a project. Where I presented a *first attempt* at creating my own door bell extension with what I knew at the time and using Verro board.

Old	New
	

We then started work. I introduced the software and the creation of the schematic diagram with an introduction to the symbol library and how you go about creating a new symbol or changing an existing one to suite the purpose of the diagram. It soon came apparent that a symbol does not need to exactly match the physical component that is going to be used in the circuit. The schematic is a design document to help the developer and other understand the operation of a circuit.



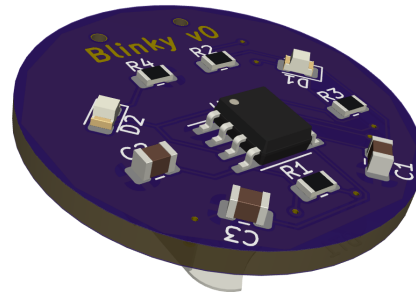
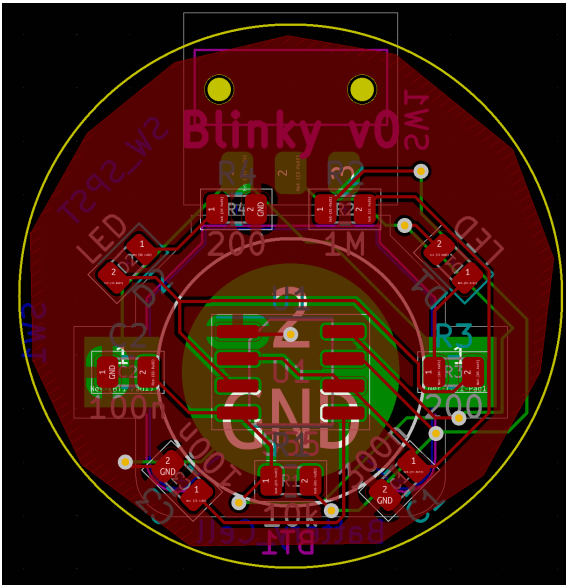


After lunch we moved onto the PCB Layout itself. Ideally the purpose of the class. I showed how to prepare the schematic for import into the PCB layout tool. The most important aspect being the footprints. A footprint is the physical form the component will take on the PCB. Each symbol must be associated to a footprint before the layout can be completed. The problem here is that for one symbol there could be any number of footprints to choose from. We need to consult the datasheet for the exact component we intend to purchase to ensure that our components will actually fit on our board and will be connected up correctly. This step should never be underestimated.

Another aspect of the layout I explained was that we need to understand the design limitations and tolerances of the PCB fabrication house. Each house will have their own set of rules and we need to configure KiCad to help us adhere to those rules. This means we need to set up the minimum distances and widths allowed for the copper.

There is the question *if this was a PCB creation workshop, how come we are preparing the design files to send off for fabrication?* The answer is that the actual fabrication of the physical PCB is only one part of the process and actually not a significant part of the overall creative process of creating the design, assembling and troubleshooting. There is more than one technique for creating a PCB and ZAM does not yet have the facilities for either of these processes. Sending the boards off for fabrication is the simplest and most effective way to introduce the more important aspects of the creative process.

So at the end of the session, we now have some design files that can be sent off and on their return we will continue with the second part - the assembly and testing of the boards.



## Things Learned and Improvements

This was the first KiCad workshop both for me and ZAM. In the planning it was important to me to make sure explain the design process workflow and highlight that at every stage of the process, we need to make design decisions. I consider this aspect is actually more important than the PCB software itself. However, I noticed there could have been a couple of things done differently.

### 1. A Simpler project.

While the project itself seemed to be simple, and easy to explain, especially with Falstad Circuit, I tend to think now for a basic KiCad introduction, the concepts of symbol and footprint library management including symbol and footprint creation could be left off for a separate workshop.

### 2. Break the workshop up

While it was nice to have the full day to concentrate on the project, it was a long day and in the end the design files were not ready and had to be handed in a couple of days later. In thinking about point 1. above, with a simpler project, the workshop could be broken up into shorter, 2 hour, sessions that could be scheduled during an evening rather than taking up a whole day on the weekend. These sessions could then focus on specific aspects like the following list. The last three items are somewhat related but have differences that make them hard or too large to include in one session.

1. Schematic Creation
2. PCB Layout
3. Library Management

4. Managing a PCB project with GIT
5. Adding graphics to a PCB
6. Custom and Fun board shapes
7. Artistic PCB i.e. Creating Blinking Badges

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Revision #11

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