Afbeelding met tekst, Lettertype, logo, symbool

Automatisch gegenereerde beschrijving

Workshop KiCad7

Advanced workshop

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| Version | Date | Changes/notes |
| V0.1 | 05-12-2023 | Setup of document |
| V0.2 | 30-12-2023 | Addition of step 1, step 2 and step 3. |
| V0.3 | 31-12-2023 | Addition of:  Step 4: Importing symbols,  Step 5: Integrating the new button,  Step 6: Redesigning the board outline and adding a hole,  Step 7: Adding text and pictures to the PCB  Step 8: Adding 3D-models |

# Workshop Version management

## Workshop Summary: What will you learn in this workshop?

**Advanced Workshop Summary: Elevate Your KiCad Skills**

*Are you ready to take your KiCad proficiency to the next level? Join our Advanced Workshop where we delve into advanced techniques and features in both the schematic and PCB editors. By the end of this workshop, you'll be equipped with the skills to add personal touches to your designs and optimize your workflow.*

1. **In Schematic Editor:**
2. **Personalization:**
   * *Add Your Name:* Learn how to add a personal touch by including your name on the schematic paper.
   * *Text Annotations:* Utilize the text feature to include useful information on the schematic, enhancing clarity and documentation.
3. **Advanced Schematic Organization:**
   * *Hierarchical Sheets:* Master the art of creating hierarchical sheets, allowing for a more organized and modular approach to complex designs.
4. **Library Management:**
   * *Component Imports:* Explore the process of importing components from external libraries, expanding your component options and design flexibility.
5. **In PCB Editor:**
6. **Aesthetics and Customization:**
   * *Rounded PCB Corners:* Learn how to round off the corners of your PCB, adding a professional and polished look to your designs.
   * *Silkscreen Additions:* Add a .bmp logo file to the PCB silkscreen and incorporate text with details such as name, date, version, project name, and designer information.
   * *Symbolic Additions:* Enhance the visual representation with useful symbols like polarity indicators (+ and - symbols).
7. **Advanced PCB Features:**
   * *Custom Holes:* Create holes in the PCB for unique features, such as keychain attachments, expanding the range of applications for your designs.
   * *Add .*BMP files to your board design
   * *3D Models:* Add missing 3D models to enhance the 3D viewer experience, ensuring a comprehensive representation of your PCB design.
8. **Extra Enhancements:**
9. **Library Integration:**
   * *Snapeda/SamacSys Integration:* Explore how to seamlessly incorporate components from external libraries like Snapeda/SamacSys, accessing an extensive range of electronic CAD symbols and models.
10. **KiCad Add-ons:**
    * *Downloadable Add-ons:* Discover and leverage KiCad downloadable add-ons to enhance your software capabilities and customize your KiCad experience according to your project requirements.

*Embark on this advanced workshop to elevate your KiCad expertise, infusing your designs with personalized elements and taking advantage of advanced features for a more professional and customized PCB design experience. Whether you are a seasoned user or looking to expand your knowledge, this workshop is tailored to refine your skills and boost your design capabilities.*

## Step 1: Add information to the schematic page

1. Open the *KeychainFlashLightAdvanced.kicad\_pro* file in KiCad
2. Open the schematic file.
3. Click on the paper icon shown below.
4. Afbeelding met tekst, schermopname, Lettertype, nummer

   Automatisch gegenereerde beschrijving
5. Add some information to the page (see example below). You may put a blue tik in the boxes if you want to export the same information to other sheets.
6. Afbeelding met tekst, schermopname, scherm, software

   Automatisch gegenereerde beschrijving
7. You should now see the information added to the red “box” in the bottom right corner.

## Step 2: Add informative text to the schematic sheet

1. On the schematic sheet, select the flowing icon in the toolbar on the right.
2. Afbeelding met Rechthoek, schermopname, lijn, diagram

   Automatisch gegenereerde beschrijving
3. A window will open, fill in the following text:
4. Afbeelding met tekst, scherm, schermopname, software

   Automatisch gegenereerde beschrijving
5. When pressing “ok” you will see that the text will follow your cursor. Place the text near the BT1 icon. You can try to experiment with the settings you see in this window.
6. Afbeelding met tekst, diagram, lijn, schermopname

   Automatisch gegenereerde beschrijving

## Step 3: Adding a hierarchical sheet

1. Press the hierarchical sheet icon on the right tool bar (see image below)
2. Afbeelding met tekst, schermopname, Lettertype, diagram

   Automatisch gegenereerde beschrijving
3. By clicking and dragging the mouse, you will create a box shape, when clicking the mouse for a second time, it will show a new window. Fill in the window as seen below and press “ok”.
4. Afbeelding met tekst, schermopname, software, scherm

   Automatisch gegenereerde beschrijving
5. Your hierarchical sheet is now made, you may now enter it by double clicking inside the box with your mouse.
6. When inside the sheet, please exit it again by pressing the arrow as seen below.Afbeelding met tekst, schermopname, Lettertype, lijn

   Automatisch gegenereerde beschrijving
7. Now select the circuit diagram and “cut” it by pressing CTRL + X on your keyboard.
8. Go back into the hierarchical sheet and paste the circuit you use cut by pressing CTRL + V. Click the mouse to place it on the sheet. See below.
9. Afbeelding met tekst, schermopname, Rechthoek, diagram

   Automatisch gegenereerde beschrijving
10. Alter the circuit as seen below:
11. Afbeelding met tekst, diagram, Lettertype, schermopname

    Automatisch gegenereerde beschrijving
12. Add a Hierarchical label by selecting the icon as seen below
13. Afbeelding met schermopname, diagram, ontwerp

    Automatisch gegenereerde beschrijving
14. Write in the window that opens the text: 3.3V input and after clicking “ok” add the item to the circuit as following: (make sure the label is touching the button cell symbol as shown)
15. Afbeelding met tekst, Lettertype, schermopname, lijn

    Automatisch gegenereerde beschrijving
16. Now do the same but for the ground (output) label, as shown below:
17. Afbeelding met tekst, Lettertype, schermopname, diagram

    Automatisch gegenereerde beschrijving
18. Now exit the hierarchical sheet by clicking the upward pointing arrow as mentioned before.
19. Hover your mouse into the hierarchical sheet box and click the right mouse button.
20. Afbeelding met tekst, schermopname, software, Webpagina

    Automatisch gegenereerde beschrijving
21. Select the import sheet pin option. A GND or 3.3V input text will begin to follow your mouse within the box. You can click your mouse to place them one after the other. You will end up with something like you can see below. You can still move the pins within the box.
22. Afbeelding met tekst, schermopname, Lettertype, nummer

    Automatisch gegenereerde beschrijving
23. Press “P” on your keyboard. A windows will load and open.
24. Find the +3.3V symbol and place it on your schematic sheet.
25. Do the same for the GND symbol.
26. Connect the symbols you just added to the pins coming from the hierarchical sheet.
27. Afbeelding met tekst, schermopname, Lettertype, lijn

    Automatisch gegenereerde beschrijving
28. You have now created a box (the hierarchical sheet) that contains your flashlight. It only has an input and output.
29. Since we just shrunk down our circuit; let’s reduce the size of the schematic page by clicking the paper symbol as we did earlier.
30. Afbeelding met tekst, schermopname, scherm, software

    Automatisch gegenereerde beschrijving
31. Select A5 or add a custom size to shrink the page size.
32. Move the hierarchical sheet box back within the borders if required.

An hierarchical sheet may not be really useful for this project, but image having multiple complicated circuits that you would like to have into a “black box” with just the input and output pins coming out of it. That is what this is mostly used for.

## Step 4: Importing symbols

Sometimes you want a particular part in your design that is not in the standard KiCad Library’s. You could create your own symbols and footprints, but this can take a lot of time. There are many websites as: <https://www.snapeda.com/> or <https://nl.mouser.com/> that either offer the symbol, footprint (combination) or even a 3D-model of a part!

**Always double check that a imported footprint is matching the exact pinout of your physical component!**

1. Go to <https://www.snapeda.com/> and search for “tactile button” or “**FSM8JH”**
2. Now press the orange download symbol and footprint button. For format, choose KiCad.
3. You will need to make an account, you can do that, than choose the kicad 6 or later version of the file. **Or you can choose to get the .zip file from the project folder.**
4. Follow the following steps to get the symbol imported to your library:
5. Extract the content of the downloaded *\*.zip* file.
6. In KiCad (Schematic editor), go to **Preferences.**
7. Click on **Manage Symbol Libraries.**
8. On the **Global Libraries** tab, click on **Browse Libraries** (the **small folder icon**)
9. Select the *.kicad\_sym* file, then click **Open.**
10. The library will appear, click **OK.**
11. Click on **Symbol Editor**.
12. Type on the filter search field, and navigate to the symbol you imported.  
    Double-click over it to open the file.
13. By searching the symbol you will find the newly imported symbol! Click the symbol and place it inside the hierarchical sheet you made earlier.
14. Afbeelding met tekst, schermopname, software, scherm

    Automatisch gegenereerde beschrijving
15. To add the footprints follow these steps:
16. Extract the content of the downloaded *\*.zip* file.
17. In KiCad (PCB editor), go to **Preferences**.
18. Click on **Manage Footprint Libraries**.
19. On the **Global Libraries** tab, click on **Browse Libraries** (the **small folder icon**)
20. Navigate to the **Folder** where the *.kicad\_mod* file is located. Then click **Select Folder**.

**Note:** You will not normally see the *.kicad\_mod* file on this step because you need to **select the folder where it is located**.

1. The library will appear, click **OK**.
2. Right click on the SW1 footprint on your PCB design.
3. Click the Open in footprint editor icon (seen below).
4. 
5. Go to file, import, footprint…
6. Afbeelding met tekst, schermopname, Lettertype, nummer

   Automatisch gegenereerde beschrijving
7. Search fort he SW\_FSM8JH.kicad\_mod file and double click it or press “open”. It is located in the project folder.
8. You will see a slightly altered version of the button we had earlier. Safe the file in the selected library while you exit the popup window
9. Afbeelding met tekst, schermopname, scherm, software

   Automatisch gegenereerde beschrijving
10. The button is now saved to in the Button\_Switch\_THT library.
11. Lets add the new footprint to the board by selecting SW1 and then selecting “Change Footprint…”
12. Afbeelding met tekst, schermopname, Lettertype, nummer

    Automatisch gegenereerde beschrijving
13. In the popup window, click the “second” library icon  for the new footprint library id.
14. Search for the FSM8JH. You will be presented with a preview.
15. Afbeelding met tekst, schermopname, software, nummer

    Automatisch gegenereerde beschrijving
16. Click twice on the right SW\_FSM8JH (now highlighted in blue) you will see the new footprint id in the box after the popup window closes.
17. Click on “Change” and exit/close the window.
18. You have now got a new footprint for the button.

An important side-note as that this process can be done many ways and could and should be “automated”. There is for example a program for the parts distributor Mouser that automatically import the files you want to add to your library. For Mouser it is [SamacSys](https://nl.mouser.com/electronic-cad-symbols-models/), which allow you to import the footprints automatically you find along components on their website. This may safe you a lot of time.

## Step 5: Integrating the new button

1. Go to the PCB editor if you aren’t there already.

Your PCB probably looks something like this:

Afbeelding met tekst, schermopname, cirkel, diagram

Automatisch gegenereerde beschrijving

1. Lets fix the disconnected button first. You should be able to do that with the skills you gained/now have.
2. But there seems to be a problem… 2 of the pads are not connected to anything.
3. We forgot to add in the new symbol at the schematic.
4. Go back to the schematic and connect the button you have placed before within the hierarchical sheet (with 4 connections) as shown below:
5. Afbeelding met tekst, diagram, schermopname, Lettertype

   Automatisch gegenereerde beschrijving
6. You can run a ERC, but don’t have to.
7. Go back to the PCB editor and click the button (or F8) on the top toolbar
8. Afbeelding met tekst, Lettertype, schermopname

   Automatisch gegenereerde beschrijving
9. Click “Update PCB” and after closing the window, reconnect the button.

Your PCB should now look something like this:

Afbeelding met schermopname, cirkel, trein

Automatisch gegenereerde beschrijving

1. Let’s add some basic information to the page settings here. This is just the same as on the schematic page settings. Also change the paper size to A5 format.

## Step 6: Redesigning the board outline and adding a hole

The PCB as it is now is a little boring and not really a keychain, because of the absence of a hole. We will now make the PCB **more tactile and visually appealing**, ensuring it is nicer to touch. Select the Egde.Cuts layer on the right.

1. Then select the “circle” tool  and draw a circle at the upper right corner (as shown below). You can change the Grid settings in the top toolbar, this allows you to move the circle with more (or less) precision.
2. Afbeelding met cirkel, schermopname, Graphics, Kleurrijkheid

   Automatisch gegenereerde beschrijving
3. Now let’s do something about those sharp corners by selecting the “arc” tool. 
4. Try to draw an arc in the upper right corner of the PCB. You can try to use the grid settings to get more precision (0.2540, worked for me).
5. You can do this for all for corners, by moving the arcs and connecting the lines to them. This may be a bit of trial in error.
6. Afbeelding met schermopname, tekst, cirkel

   Automatisch gegenereerde beschrijving

## Step 7: Adding text and pictures to the PCB

Of course, the PCB is missing some information on it; there should be the name of the developer, the version number of the board and the date as a starter. Maybe you can think of more things to add. Apart from that, we should add an image to the back of the board so it is clear what the board was/is used for.

1. Now let’s add some text to the board by using the “text” item tool. 
2. Make sure to select the Layer: F.Silkscreen
3. Write some text in the text box and click “ok”.
4. Place the text somewhere on the board, for example, the upper left corner. Afbeelding met tekst, Lettertype, schermopname, lijn

   Automatisch gegenereerde beschrijving
5. We will now add a .bmp file.
6. Go to the main page of KiCad and select the Image Converter: Afbeelding met tekst, schermopname, Lettertype

   Automatisch gegenereerde beschrijving
7. Click: “Load Sourcde Image” and select the *logo for workshop.bmp file.*
8. *Choose the following settings and click: “Export to Clipboard”*
9. *Afbeelding met tekst, schermopname, software, Computerpictogram

   Automatisch gegenereerde beschrijving*
10. *Press CTRL + V while you are in the PCB editor and press “f” before placing the logo somewhere on your PCB, this switches it to the back side of the PCB.*
11. *You can remove those \*\*\* by double clicking the image on your PCB and unticking the “show” box with the reference designator.*
12. *You have successfully added your own.bmp file!*
13. *You can add some more logos by choosing a footprint (or press A). I will be adding the: OSHW-Logo2\_24.3x20mm\_SilkScreen to my board.*
14. *You can see the look of the frond and back of the PCB in the 3D-viewer (press ALT+ 3)*
15. *Afbeelding met tekst, schermopname, bal, cirkel

    Automatisch gegenereerde beschrijving* Afbeelding met tekst, Lettertype, logo, schermopname

    Automatisch gegenereerde beschrijving
16. *Now in the final step we will add the missing 3D-models.*

## Step 8: Adding 3D-models

For your final step, we will be adding the missing 3D-models to the model. This may seem useless for now, but a very useful feature of KiCad is the ability to export your 3D model. Tis 3D-model can be imported into other CAD programs like SolidWorks or Fusion360 and such. Your IDE co-worker/peer will thank you later.