

# Image to DXF or GDS Conversion

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February 1, 2024

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Sometimes, it is easier to generate an image of the pattern one wants to expose than it would be to draw the pattern by hand or with a script. The pattern can be for example created in Python and exported to a bitmap image (.bmp), which is not hindered by the limitations of GDS packages. Other examples include images of your face or the logo of your lab. There are many tools to convert these to a bitmap.

However, bitmaps have several limitations:

1. If it's a large enough bitmap, the MLA can't handle it. The software will crash.
2. The MLA currently doesn't have the capability to align bitmaps (greyscale or binary).
3. Our EBL can't take bitmaps as input.

As of now, there are not very many good tools for handling this situation. Have no fear! There is a standard solution. **Here are the steps:**

1. Download "**InkScape**," a free vector graphics tool.
2. **Open** the image in InkScape using default options.
3. **Click** on the image to select it.
4. **Path > Trace Bitmap**

- The **number of scans** determines how many layers you want. You may want to reduce the number of scans to save yourself some work.
- "**Stack scans**" determines whether or not colors will be overlapping. For greyscale lithography, you can choose whether to overlap your layers. For binary lithography, it doesn't matter because you will end up with only one layer at the end.
  - If you end up with undesired gaps between layers, you may need to check "stack scans" and then do Boolean operations in Klayout.
- Check "Remove Background" to automatically remove the source image.
- Under "Options," uncheck "**Suppress Speckles**" and "**Optimize Paths.**"
- It is worth playing with the "round corners" option.

5. If you have multiple layers, you must **select** each layer/color and move it to its own layer. This has to be done manually.

- **Create** the layers first (**shift+ctrl+N**), and remember Klayout will sort them alphabetically.
- **Right click** each color **twice** to select it. The color will appear in the bottom left corner of InkScape.
- Right click > **move to layer**
- **Alternatively** you can open the layer toolbox (**shift+ctrl+L**) and the object tool box (**Object menu > Objects**). Clicking on the object in the object toolbox will highlight it in the drawing window. **Shift+pg up or pg down** will move the object into or out of layers.

6. Once your layers are sorted, do File > Save As... and select DXF as your file type.

- **Check** “ROBO-Master” and **uncheck** “LWPOLYLINE”

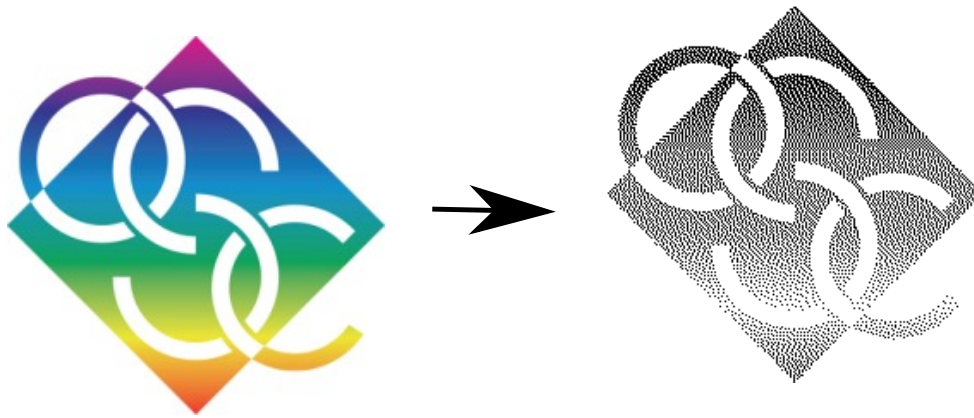
7. Open the DXF file in **Klayout**. Make sure everything is how you want it to be. You may need to move layers around or use Boolean layer manipulations to remove overlaps.

8. Adjust the **scale** of the layout to make sure your features are the correct size. Mostly, you will need to scale the entire layout at once by selecting the whole thing and doing **Edit > Selection > Scale**

9. **Save** your file from Klayout. Here is where you can save the file as a GDS file if your pattern is not intended for greyscale.

### Binary pixel art:

It is possible to create the illusion of greyscale in a binary image.



This is the description on how to do this in **GIMP 2.10**. Other image manipulation programs should be able to do this as well.

1. Load the image and select **Image > Mode > Indexed**.
2. Under “Colormap,” select **black and white (1bit)**. Under “Dithering,” select **Floyd-Steinberg**.