

KLayout Productivity Suite Documentation

Martin Köhler

2025-11-27

Table of contents

1	Introduction	1
1.1	About KLayout Productivity Suite	1
1.2	Acknowledgements	2
1.3	Installation	2
1.3.1	Option 1: Using IIC-OSIC-TOOLS Docker Image	2
1.3.2	Option 2: Standalone Installation	2
2	Align Tool	4
2.1	Motivation	4
2.2	Usage	4
2.2.1	Pre-Selection	4
2.2.2	Selecting Features	5
2.2.3	Example 1: point-to-point alignment	5
2.2.4	Example 2: edge-to-edge alignment	5
2.3	Assign key binding A to the tool	10
3	Move Quickly Tool	11
3.1	Usage	11
3.1.1	Pre-selection	11
3.1.2	Tool activation and deactivation	11
3.1.3	Example 1: Moving single object (mouse)	11
3.1.4	Example 2: Moving single object (keyboard)	12
3.1.5	Example 3: Extend selection	12
3.1.6	Example 4: Drag selection	12
3.2	Pro-Tip: assign key binding M to the tool	12
4	Pin Tool	13
4.1	Motivation	13
4.2	Usage	13
4.2.1	Placing a pin	13
4.2.2	Combined usage with the <i>Layer Shortcuts Plugin</i>	16
4.3	JSON tech files for supported PDKs	16
5	Layer Shortcuts Plugin	17
6	Library Manager	18
7	Automatic Backups	19

1 Introduction

1.1 About KLayout Productivity Suite

[KLayout](#) is an open source VLSI layout viewer and editor.

The *KLayout Productivity Suite* is a collection of plugins developed by the [Department for Integrated Circuits \(ICD\), Johannes Kepler University \(JKU\)](#) to enhance your layout design productivity.

The available plugins are listed in the table below.

Title	Description	Repository URL
Align Tool Plugin	Tool to align layout objects	https://github.com/iic-jku/klayout-align-tool
Automatic Backups	Create automatic backups of edited layouts	https://github.com/iic-jku/klayout-auto-backup
Layer Shortcuts Plugin	Shortcuts to quickly change layer visibility	https://github.com/iic-jku/klayout-layer-shortcuts
Library Manager Plugin	Library manager for hierarchical layouts	https://github.com/iic-jku/klayout-library-manager
Move Quickly Tool Plugin	Tool to quickly move layout objects	https://github.com/iic-jku/klayout-move-tool
Pin Tool Plugin	Efficient placement of pins	https://github.com/iic-jku/klayout-pin-tool
Plugin Utilities Library	Utility library used by various IIC KLayout plugins	https://github.com/iic-jku/klayout-plugin-utils

 Tip

The *KLayout Productivity Suite* source code itself is made publicly available on GitHub and shared under the GPL-3.0 license (see links above in table above).

The *KLayout Productivity Suite documentation* source code is made publicly available on GitHub ([follow this link](#)) and shared under the Apache-2.0 license.

Please feel free to create issues and/or submit pull requests on GitHub to fix errors and omissions! The production of the tool and this document would be impossible without these (and many more) great open-source software products: [KLayout](#), [Quarto](#), [Python](#), [ngspice](#), [Numpy](#), [Scipy](#), [Matplotlib](#), [Git](#), [Docker](#), [Ubuntu](#), [Linux](#)...

1.2 Acknowledgements

TODO

1.3 Installation

Generally, the plugins can be installed using the KLayout Package Manager.

- `KLayoutProductivitySuite` acts as a meta-package that can be installed in KLayout's Package Manager. Once installed, it automatically pulls in all the plugins as `dependencies` through the `grain.xml`

- Alternatively, single plugins can be cherry-picked using the plugin title in the above table (without whitespace)

As for the dependencies, there are multiple options available.

1.3.1 Option 1: Using IIC-OSIC-TOOLS Docker Image

We provide a comprehensive, low entry barrier Docker image that comes pre-installed with most relevant open source ASIC tools, as well as the open PDKs. This is a pre-compiled Docker image which allows to do circuit design on a virtual machine on virtually any type of computing equipment (personal PC, Raspberry Pi, cloud server) on various operating systems (Windows, macOS, Linux).

For further information please look at the [Docker Hub page](#) and for detailed instructions at the [IIC-OSIC-TOOLS GitHub page](#).

Linux

In this document, we assume that users have a basic knowledge of Linux and how to operate it using the terminal (shell). If you are not yet familiar with Linux (which is basically a must when doing integrated circuit design as many tools are only available on Linux), then please check out a Linux introductory course or tutorial online, there are many resources available.

A summary of important Linux shell commands is provided in [IIC-JKU Linux Cheatsheet](#).

1.3.2 Option 2: Standalone Installation

- [KLayout](#) layout tool:
 - [get the latest pre-built package version](#)
 - or [follow the build instructions](#)
- [Skywater sky130A PDK](#):
 - optional
 - `pip3 install --upgrade ciel` (install PDK package manager)
 - `ciel ls-remote --pdk sky130A` (retrieve available PDK releases)
 - * for example PRE-RELEASE 0c1df35fd535299ea1ef74d1e9e15dedaeb34c32 (2024.12.11)
 - `ciel enable --pdk sky130A 0c1df35fd535299ea1ef74d1e9e15dedaeb34c32` (install a PDK version)
 - PDK files now have been installed under `$HOME/.volare/sky130A`
- [IHP SG13G2 PDK](#):
 - optional
 - `pip3 install --upgrade ciel` (install PDK package manager)
 - `ciel ls-remote --pdk ihp-sg13g2` (retrieve available PDK releases)
 - * for example PRE-RELEASE cb7daaa8901016cf7c5d272dfa322c41f024931f (2025.07.18)
 - `ciel enable --pdk ihp-sg13g2 cb7daaa8901016cf7c5d272dfa322c41f024931f` (install a PDK version)
 - PDK files now have been installed under `$HOME/.volare/ihp-sg13g2`

2 Align Tool

2.1 Motivation

Boost your layout productivity with quick alignments of layout elements, such as

- cell instances
- shapes (e.g. polygons, boxes, paths)

Choose constraints by selecting features, such as

- edges (the entire edge)
- points (edge end points or the edge middle point)

2.2 Usage

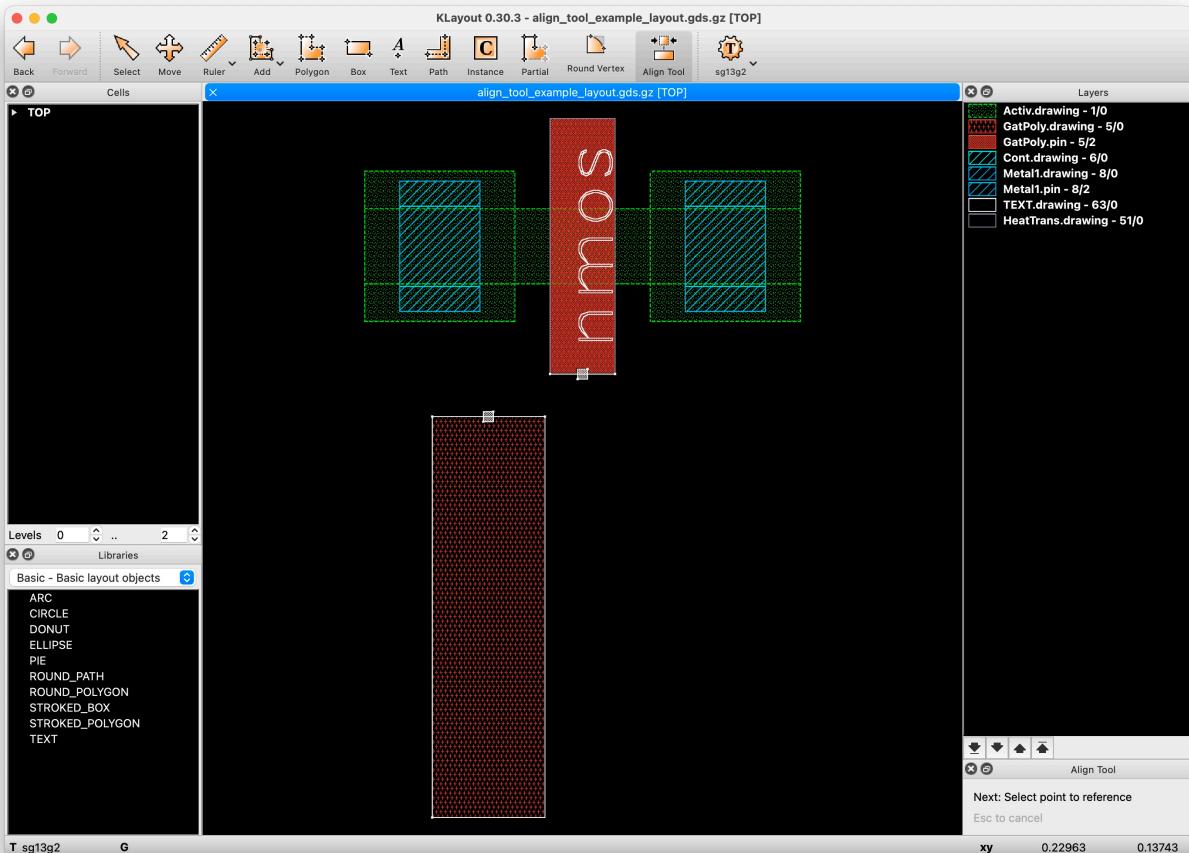


Figure 1: Align Tool

2.2.1 Pre-Selection

You can select instances and shapes (you want to align), prior to invoking the tool, thus making a *pre-selection*. The selection status will be displayed in the dock setup panel, as seen in Figure 2. If no pre-selection is made, the shape or instance of the source reference point is also the object being aligned.

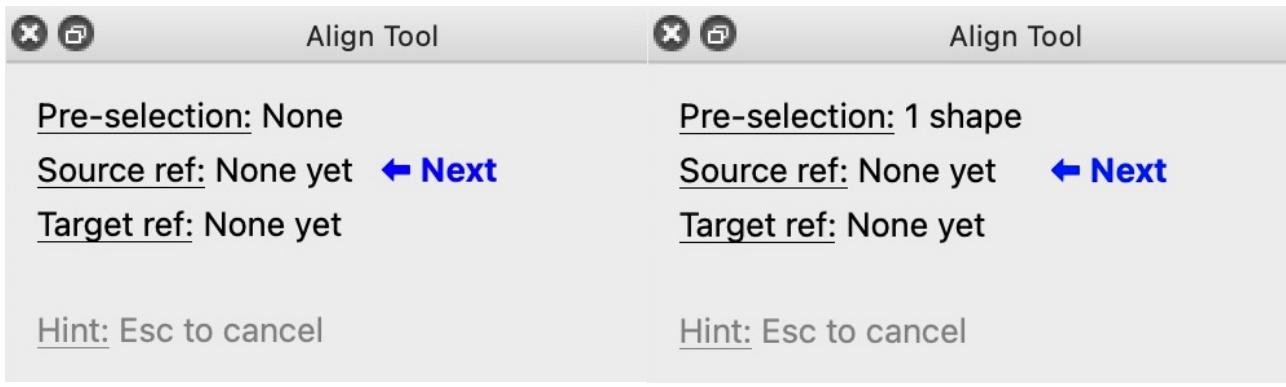


Figure 2: Dock Setup Panel

2.2.2 Selecting Features

Either points or edges can be chosen as the alignment reference.

1. Select the midpoint or one of the endpoints of an edge of a shape or instance bounding box. The search box is shown as a dashed rectangle
 - points must be within the search box
 - edges just intersect the search box
2. Left-click to apply the selection

2.2.3 Example 1: point-to-point alignment

1. Ensure there is no pre-selection
2. Click the *Align* tool (Figure 3)
 - or press A to enter the align mode (if you've configured the key binding [as explained here](#)).
3. Select feature of the shape to be moved/aligned, the *source reference* (Figure 4)
4. Select feature of the other shape that acts as the *target reference* (Figure 5)
5. Left-click to apply the alignment (Figure 6)
6. Alternatively, press Esc to cancel the operation

2.2.4 Example 2: edge-to-edge alignment

Notes on aligning edges to edges:

- edges must be parallel
- if the edge is too short and a point is always marked for selection, zoom in
- in edge-to-edge mode, alignment is performed only along the perpendicular axis, so
 - for horizontal edges: in the Y direction
 - for vertical edges: in the X direction

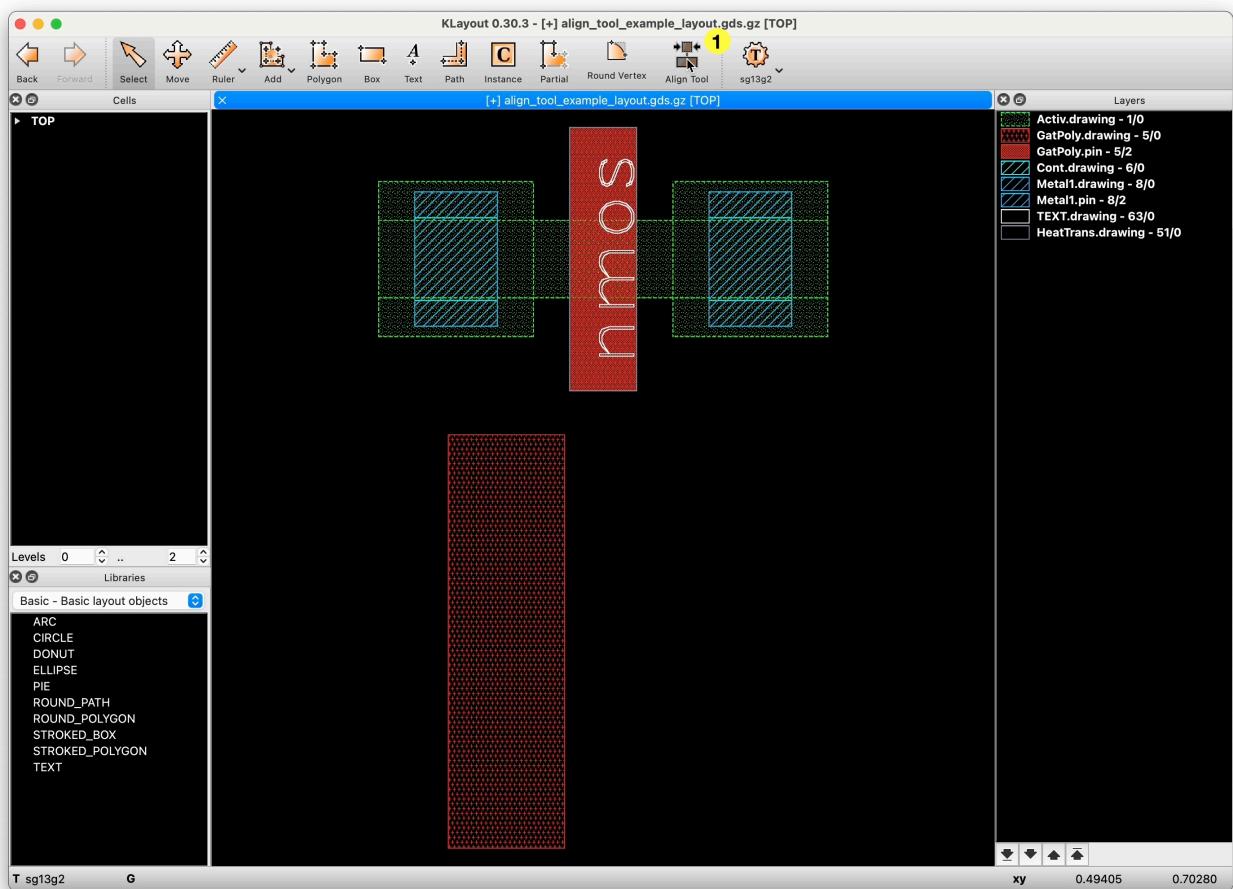


Figure 3: Select Align Tool

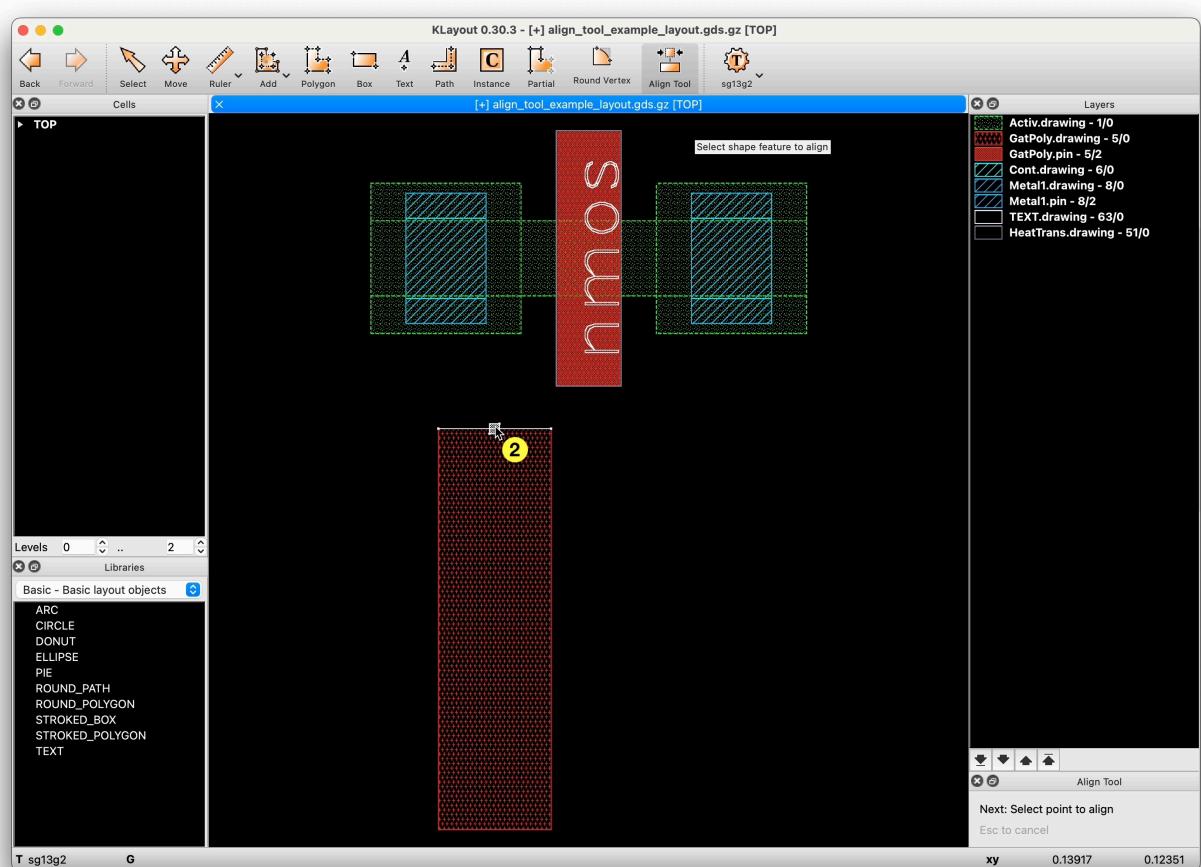


Figure 4: Select *source reference* point to align

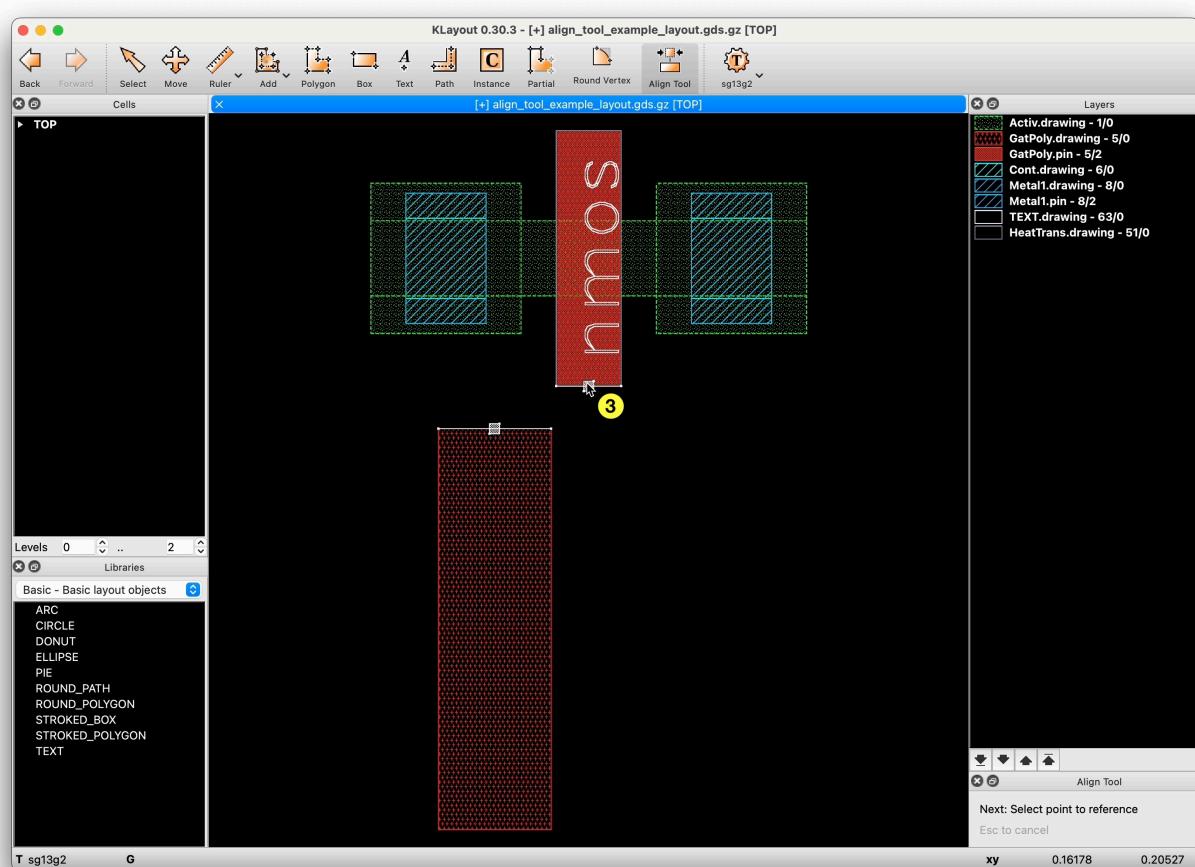


Figure 5: Select *target reference* point to move to

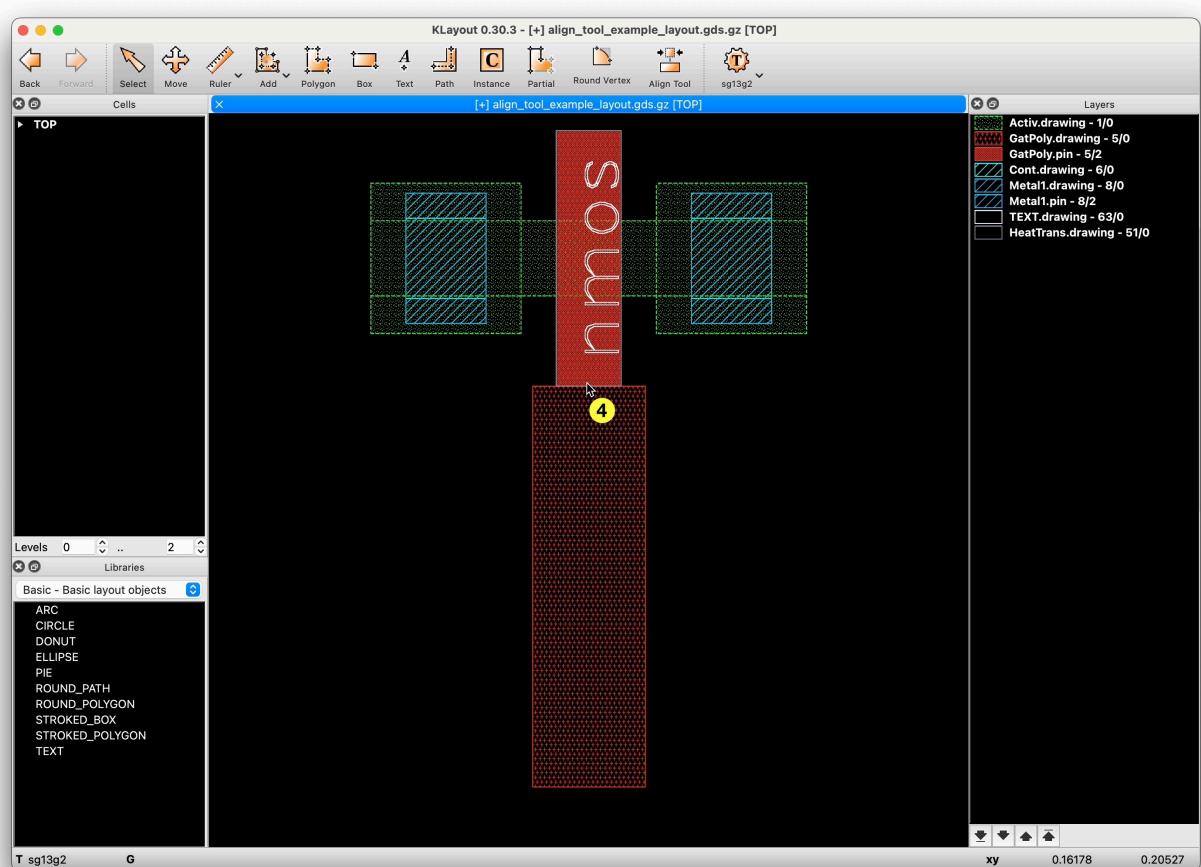


Figure 6: Alignment done

2.3 Assign key binding A to the tool

To configure a key binding:

- In the main menu, open the Preferences/Settings in KLayout
- Navigate to *Application*→*Customize Menu*
- Search for ‘Align’
- Assign the shortcut A to the path `edit_menu.mode_menu.Align`

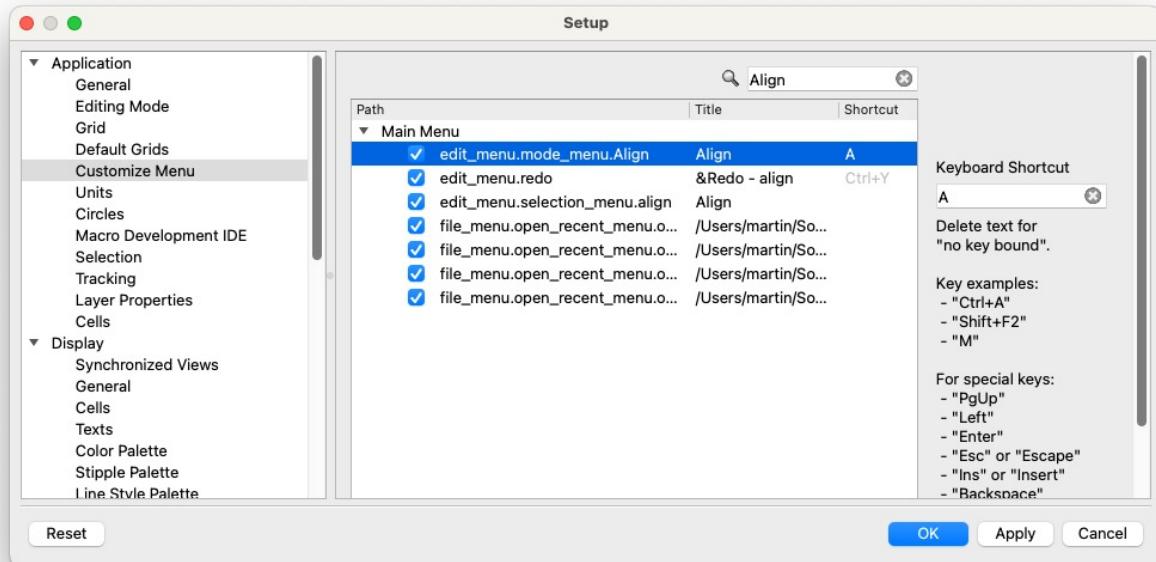


Figure 7: Assign key binding

3 Move Quickly Tool

Boost your layout productivity with quick moves of layout elements, such as

- cell instances
- shapes (e.g. polygons, boxes, paths)

3.1 Usage

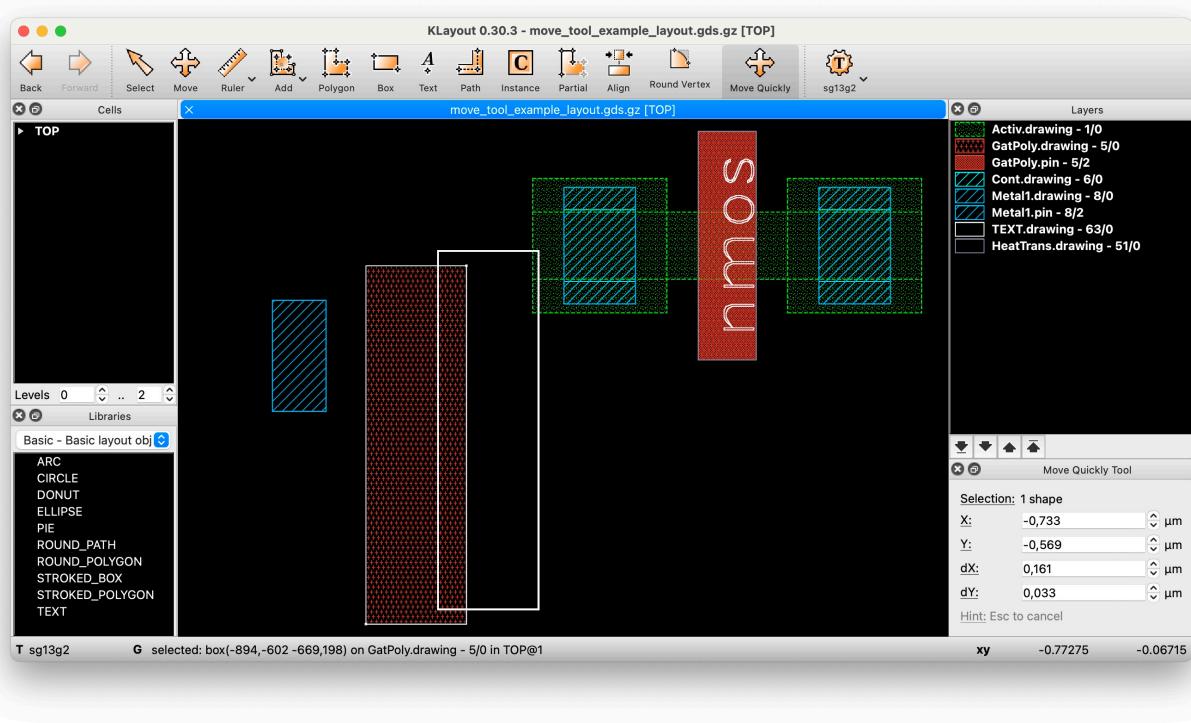


Figure 8: Move Quickly Tool

3.1.1 Pre-selection

- You can select instances and shapes (you want to move), before invoking the tool
 - The selection will be displayed in the dock setup panel

3.1.2 Tool activation and deactivation

- Click the *Move Quickly* tool or press M to enter the tool mode (if you've configured the key binding [as explained here](#))
- Press Esc at any time to abort the tool and activate the regular KLayout selection tool.

3.1.3 Example 1: Moving single object (mouse)

- Activate the tool
- If there is no selection, left-click an object to move it
- Otherwise, left-click again to move it
- Move the mouse to the destination
- Click to move the object

3.1.4 Example 2: Moving single object (keyboard)

- Activate the tool
- Left-click an object to select it
- Press **Tab** to enter the dock setup widget
- Provide either absolute positions or relativ deltas
- Press **Enter** to commit the move operation

3.1.5 Example 3: Extend selection

To keep the current selection, and extend it with additionally selected objects:

- Activate the tool
- Select an object
- Hold **Shift** and select additional object(s)
- Click to start moving
- Move the mouse to the desired destination
- Commit the move operation with a click or by pressing **Enter**

3.1.6 Example 4: Drag selection

- Activate the tool
- Select object(s) by dragging the mouse
- Hold **Shift** and select additional object(s)
- Click to start moving
- Move the mouse to the desired destination
- Commit the move operation with a click or by pressing **Enter**

3.2 Pro-Tip: assign key binding M to the tool

- In the main menu, open the Preferences/Settings in KLayout
- Navigate to *Application*→*Customize Menu*
- Search for ‘Move’
- Assign the shortcut **M** to the path `edit_menu.mode_menu.Move_quickly`

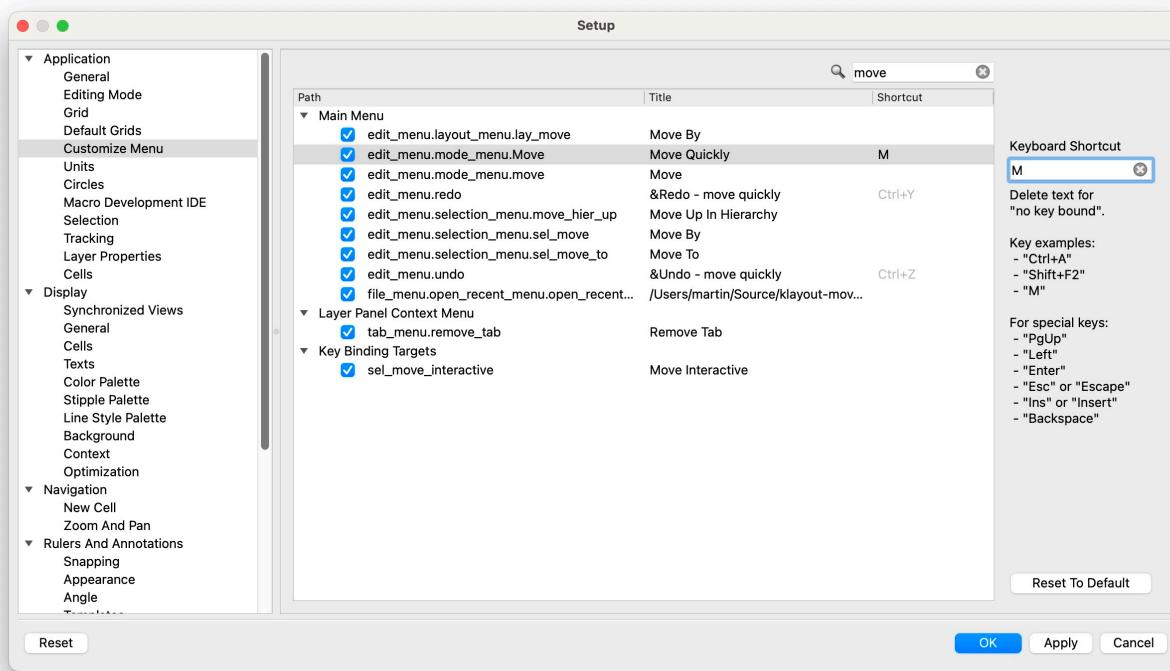


Figure 9: Assign key binding

4 Pin Tool

4.1 Motivation

Boost your layout productivity with quick placement of pins.

4.2 Usage

4.2.1 Placing a pin

The *Pin Tool* will automatically choose the appropriate layer based on the selection in the layer table.

E.g., if currently `TopMetal1.drawing` is selected (Figure 10), the layer `TopMetal1` will be chosen.

Before placing the pin, configure the desired properties in the dock setup panel (Figure 11):

- *Layer*: usually pre-filled with the appropriate layer, but can be changed here
- *Pin*: name of the pin label
- *Width / Height*: dimensions of the pin

To place a pin:

- Move the mouse to preview the pin placement (Figure 12)
 - A dashed box will indicate the bounds of the pin
 - A small circle will indicate the placement position
- Left-click to place a pin
- Press `Esc` to quit the tool

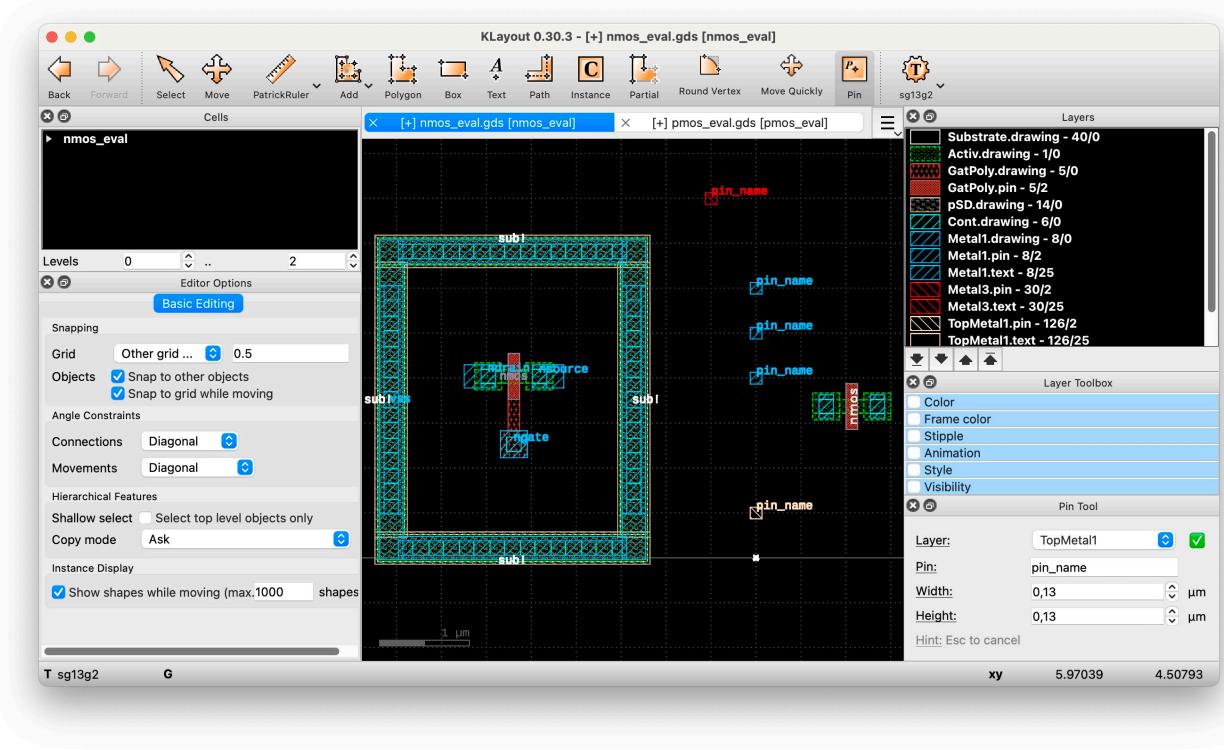


Figure 10: Pin Tool

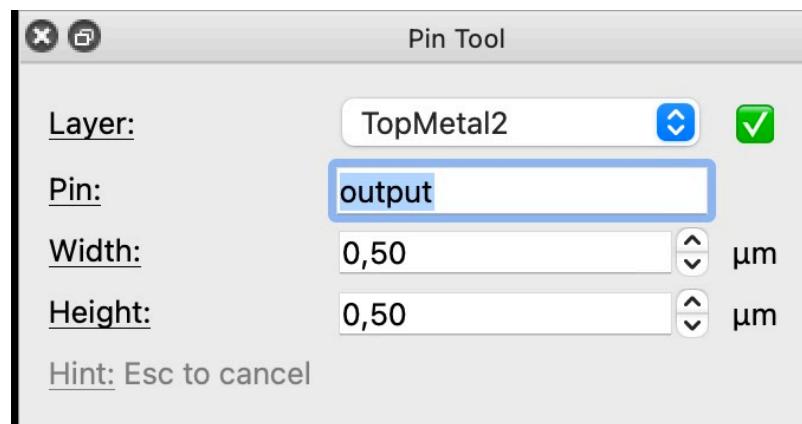


Figure 11: Dock Setup Panel

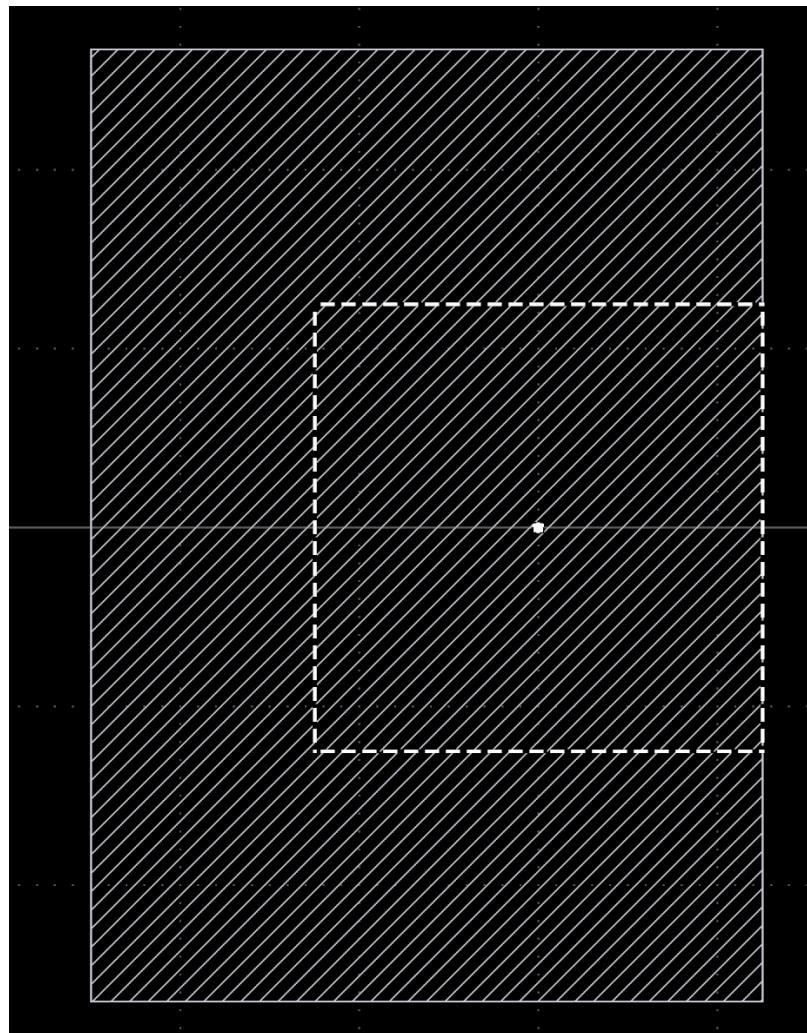


Figure 12: Pin Placement

4.2.2 Combined usage with the *Layer Shortcuts Plugin*

Say you want to place the same pin in multiple layers, there is a nice use case combination with the *Layer Shortcuts Plugin*:

- activate the *Pin Tool* and name the pin label
- press key 1 to focus on layer group **Metal1**
- place a pin in layer **Metal1**
- press key 2 to focus on layer group **Metal2**
- place a pin in layer **Metal2**
- press key 3 to show all layers

4.3 JSON tech files for supported PDKs

 Note

The JSON tech files are currently available for the PDKs:

- IHP SG13G2
- Skywater sky130

5 Layer Shortcuts Plugin

TODO

6 Library Manager

TODO

7 Automatic Backups

TODO