

# OpenROAD PA1

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[HTTPS://GITHUB.COM/THE-OPENROAD-PROJECT/OPENROAD-FLOW-SCRIPTS](https://github.com/the-openroad-project/openroad-flow-scripts)

# OpenROAD

## (Modify Makefile)

```
cd ~/OpenROAD-flow-scripts/flow
```

In a Linux environment, modify the Makefile (OpenROAD-flow-scripts/flow) to suit your Design.

```
#DESIGN_CONFIG ?= ./designs/nangate45/CompMultiplier/config.mk
```

```
#DESIGN_CONFIG ?= ./designs/nangate45/CompDivider/config.mk
```

```
104 # Default design
105 #DESIGN_CONFIG ?= ./designs/nangate45/gcd/config.mk
106 #DESIGN_CONFIG ?= ./designs/nangate45/CompALU/config.mk
107 DESIGN_CONFIG ?= ./designs/nangate45/CompMultiplier/config.mk
```

Navigate to the scripts folder and open the file **synth.tcl**. In this script, you comment out **line 31** (or another specified line) to prevent an issue or to tailor the synthesis flow for your design.

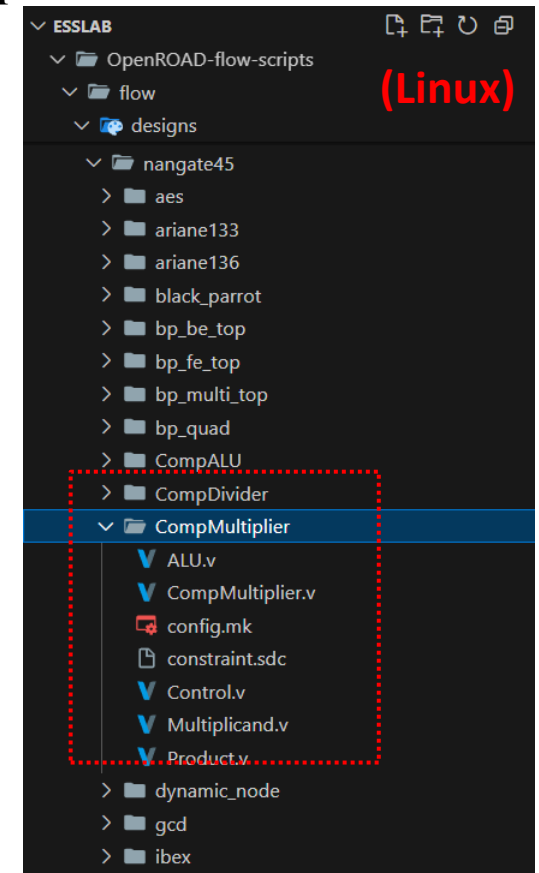
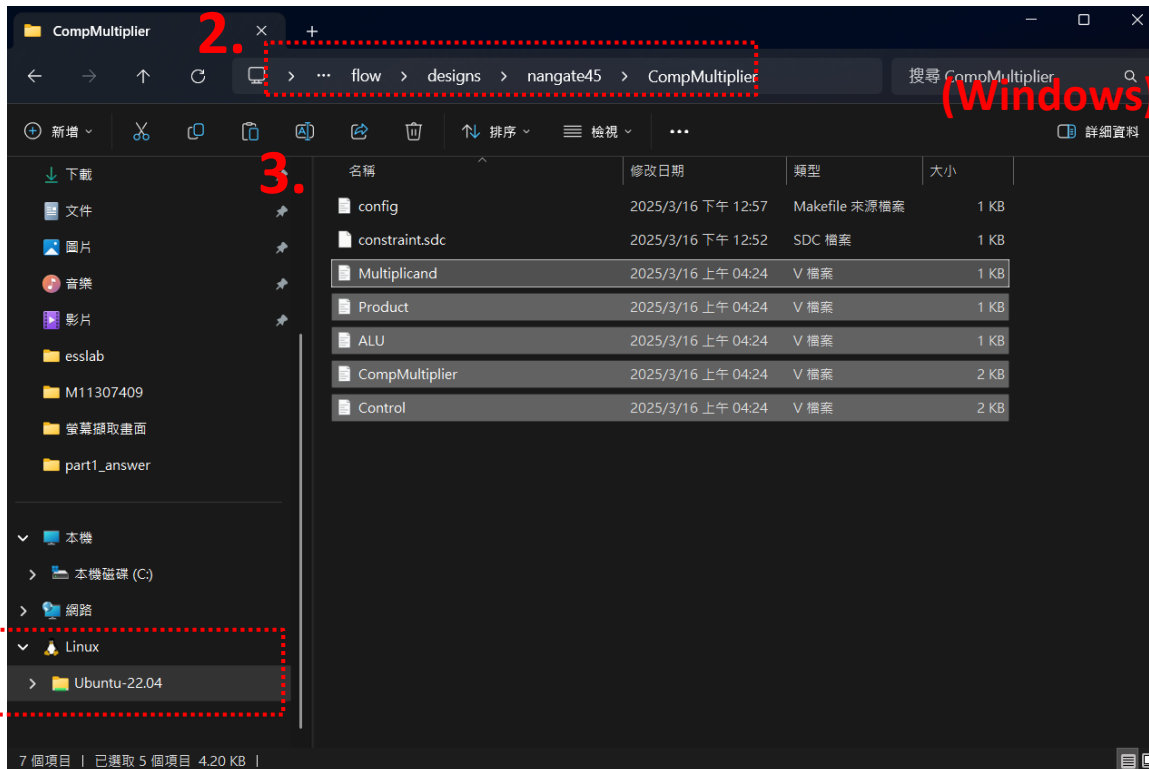
```
30 # Re-run coarse-level script, this time do pass -flatten
31 #synth -run coarse:fine {*}${::env(SYNTH_FULL_ARGS)}
```

# OpenROAD

## (Put your Design into Linux)

Create file “CompMultiplier” & save your design in this path:

```
cd ~/OpenROAD-flow-scripts/flow/designs/nangate45
```



# OpenROAD (Path of CompMultiplier)

---

~/OpenROAD-flow-scripts/flow

|-----designs

|           |-----nangate45

|                   |-----CompMultiplier

|                           |-----CompMultiplier.v

|                           |-----ALU.v

|                           |-----Control.v

|                           |-----Multiplicand.v

|                           |-----Product.v

|                           |-----config.mk

|                           |-----constraint.sdc

|-----reports

|-----Makefile

# OpenROAD (Path of CompDivider)

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~/OpenROAD-flow-scripts/flow

|-----designs

|           |-----nangate45

|                   |-----CompDivider

|                           |-----CompDivider.v

|                           |-----ALU.v

|                           |-----Control.v

|                           |-----Remainder.v

|                           |-----Divisor.v

|                           |-----config.mk

|                           |-----constraint.sdc

|-----reports

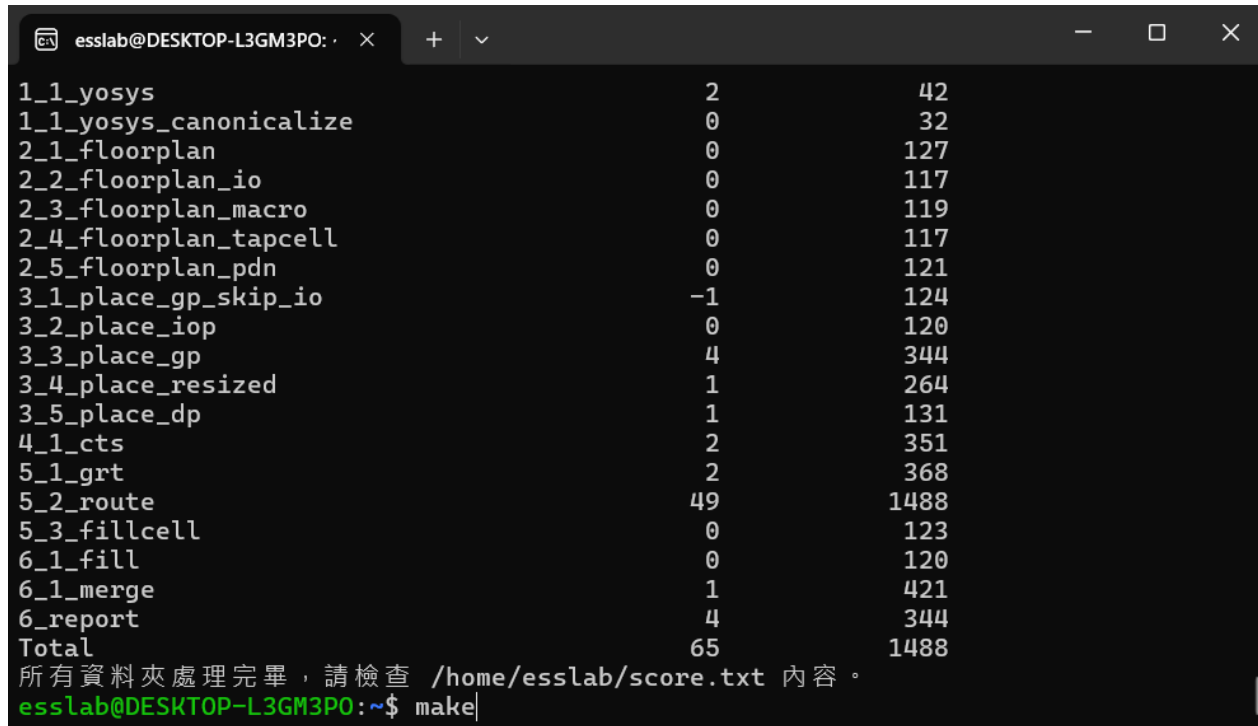
|-----Makefile

# OpenROAD

```
cd ~/OpenROAD-flow-scripts/flow
```

```
Make clean_all
```

```
make
```



```
esslab@DESKTOP-L3GM3PO: ~$ make
```

|                        |    |      |
|------------------------|----|------|
| 1_1_yosys              | 2  | 42   |
| 1_1_yosys_canonicalize | 0  | 32   |
| 2_1_floorplan          | 0  | 127  |
| 2_2_floorplan_io       | 0  | 117  |
| 2_3_floorplan_macro    | 0  | 119  |
| 2_4_floorplan_tapcell  | 0  | 117  |
| 2_5_floorplan_pdn      | 0  | 121  |
| 3_1_place_gp_skip_io   | -1 | 124  |
| 3_2_place_iop          | 0  | 120  |
| 3_3_place_gp           | 4  | 344  |
| 3_4_place_resized      | 1  | 264  |
| 3_5_place_dp           | 1  | 131  |
| 4_1_cts                | 2  | 351  |
| 5_1_grt                | 2  | 368  |
| 5_2_route              | 49 | 1488 |
| 5_3_fillcell           | 0  | 123  |
| 6_1_fill               | 0  | 120  |
| 6_1_merge              | 1  | 421  |
| 6_report               | 4  | 344  |
| Total                  | 65 | 1488 |

所有資料夾處理完畢，請檢查 /home/esslab/score.txt 內容。

```
esslab@DESKTOP-L3GM3PO:~$ make
```

# OpenROAD

make gui\_final

The screenshot displays the OpenROAD GUI interface. The main window shows a layout design with a grid of colored rectangles representing different layers. The left sidebar contains a 'Layers' list with checkboxes for 'Other', 'metal1', 'via1', 'metal2', 'via2', 'metal3', 'via3', 'metal4', 'via4', 'metal5', 'via5', 'metal6', 'via6', 'metal7', 'via7', 'metal8', 'via8', 'metal9', 'via9', 'metal10', 'via10', 'Nets', 'Instances', 'Blockages', 'Rulers', 'Rows', 'Tracks', 'Shape Types', 'Misc', 'Timing Path', and 'Heat Maps'. The top menu bar includes 'File', 'View', 'Tools', 'Windows', 'Options', and 'Help'. The 'Timing Report' panel on the right shows a table of timing data.

Timing Report

| Capture Clock | Required | Arrival | Slack | Skew   | Logic Delay | Logic I |
|---------------|----------|---------|-------|--------|-------------|---------|
| core_clock    | 5.048    | 0.858   | 4.191 | -0.085 | 0.642       |         |
| core_clock    | 5.048    | 0.856   | 4.192 | -0.085 | 0.637       |         |
| core_clock    | 5.048    | 0.856   | 4.192 | -0.085 | 0.636       |         |
| core_clock    | 5.048    | 0.852   | 4.196 | -0.085 | 0.637       |         |
| core_clock    | 5.048    | 0.851   | 4.197 | -0.085 | 0.632       |         |
| core_clock    | 5.048    | 0.850   | 4.198 | -0.085 | 0.630       |         |
| core_clock    | 5.048    | 0.829   | 4.219 | -0.085 | 0.612       |         |
| core_clock    | 5.048    | 0.827   | 4.222 | -0.085 | 0.611       |         |
| core_clock    | 5.048    | 0.826   | 4.222 | -0.085 | 0.607       |         |
| core_clock    | 5.048    | 0.825   | 4.223 | -0.085 | 0.606       |         |
| core_clock    | 5.053    | 0.829   | 4.223 | -0.089 | 0.614       |         |
| core_clock    | 5.048    | 0.825   | 4.223 | -0.085 | 0.605       |         |

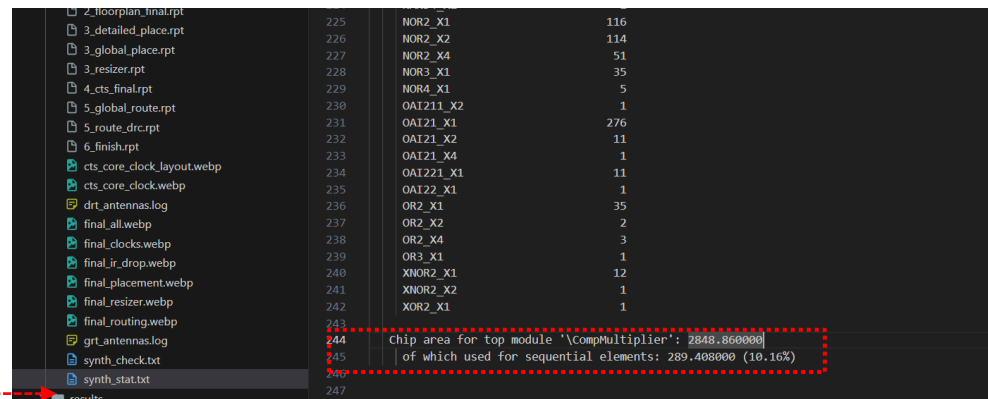
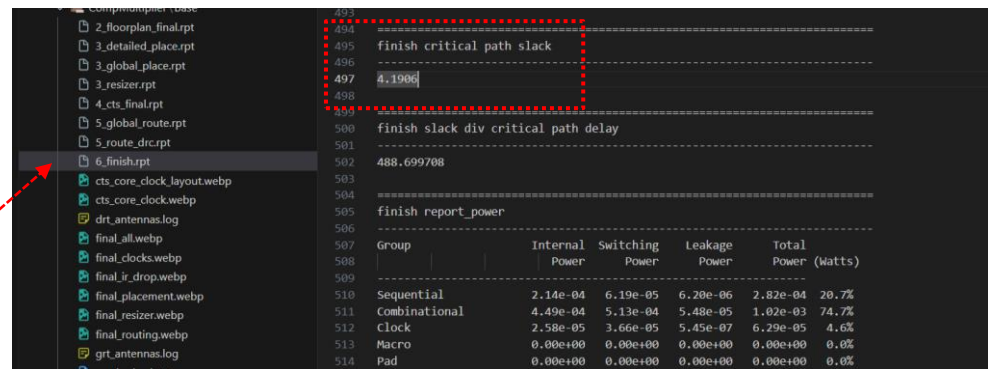
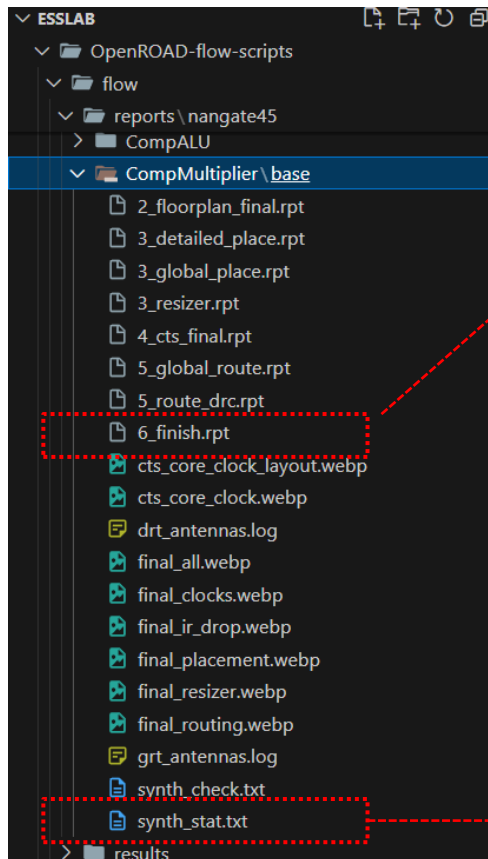
Scripting

```
esslab@DESKTOP-L3GM3PO: ~$ cd OpenROAD-flow-scripts/
esslab@DESKTOP-L3GM3PO: ~/OpenROAD-flow-scripts$ cd flow/
esslab@DESKTOP-L3GM3PO: ~/OpenROAD-flow-scripts/flow$ make gui_final
ODB_FILE=./results/nangate45/CompMultiplier/base/6_final.odb
/home/esslab/OpenROAD-flow-scripts/tools/install/OpenROAD/bin/openroad -gui /home/esslab/OpenROAD-flow-scripts/flow/scripts/open.tcl
QStandardPaths: wrong permissions on runtime directory /run/user/1000/, 0755 instead of 0700
OpenROAD v2.0-18389-ged798d639
Features included (+) or not (-): +GPU +GUI +Python
```

# OpenROAD

## (Check Area & Slack)

`cd ~/OpenROAD-flow-scripts/flow/reports/nangate45/CompMultiplier`





# OpenROAD Flow

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1. Modify Makefile & synth.tcl
2. Put your Design Files & Constraints into Linux
3. Make
4. Check your Design

# Optimization Grading

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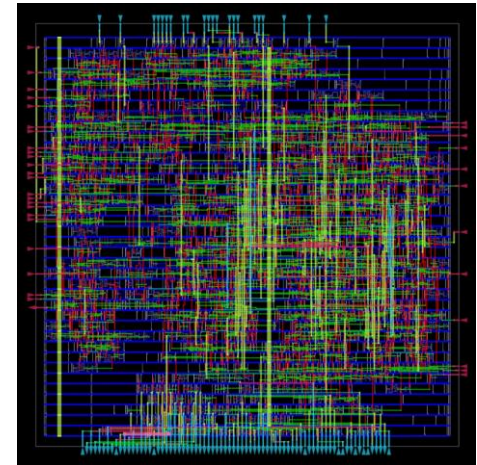
## Design1

Number of cells: 1227

Chip area for top module '\CompMultiplier': 1631.112000

worst slack: 4.5184

$Z(A) = -0.004$  /  $Z(P) = -1.656044$  /  $Z = -1.66004$



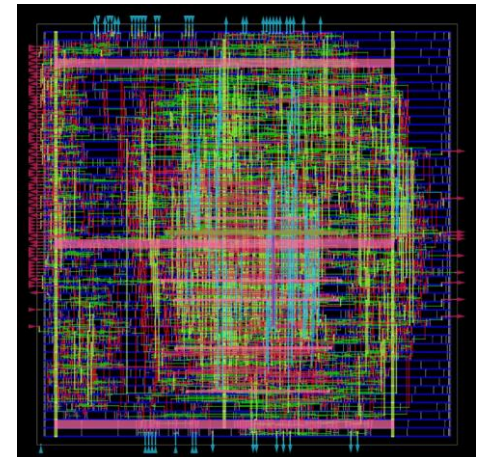
## Design2

Number of cells: 2362

Chip area for top module '\ CompMultiplier ': 2535.778000

worst slack: 0

$Z(A) = 1.789085$  /  $Z(P) = 1.2376866$  /  $Z = 3.026772$



# Disclaimer (OpenROAD)

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Source: <https://github.com/the-openroad-project>

# Disclaimer (Klayout)

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Version 3, 29 June 2007

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Source: <https://github.com/KLayout/klayout?tab=GPL-3.0-1-ov-file>

# Disclaimer

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