IC-CAD Labs. Analog Part

Lect. 3 Cadence Layout Editor

Analog Circuit Design

• Basic Flow





● /office1/class/2022_1_ICCAD/2022_1_ICCADxx 폴더에서 다음 명령어를 입력합니다.

 \rightarrow source .chsrc

● 그 다음 Cadence Schematic Editor를 작업할 폴더로 이동합니다.

→ cd /office1/class/2022_1_ICCAD/2022_1_ICCADxx/PDK/FreePDK45/cds_ncsu

● 그 다음 해당 폴더에 있는 setup.csh를 import 합니다.

 \rightarrow source setup.csh

*위의 모든 과정이 커맨드 창에 <u>iccad</u>를 입력하면 진행되도록 셋업이 되어있습니다.

● virtuoso & 혹은 vir 를 커맨드창에 입력합니다.

• Tools \rightarrow Library Manager

Virtuoso® 6.1.8-64b - Log: /office1/class/2021_2_ICCAD/2021_2_ICCAD_master/CDS.log@jisung -	_		\times
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위와 같은 창이 생성되는지 확인해보세요.

● Library Manager → New → Library

Name에는 week3 라고 씁니다

● Technology File 불러오기 → MOSFET의 Model이 정의되어 있는 파일

Library manager File \rightarrow New \rightarrow Cell View

Library Manager: Directory ..._master/PDK/FreePDK45/cds_ncsu@jisung

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O <u>p</u> en Shell Window	Ctrl+P		
E <u>x</u> it	Ctrl+X		
test			
week2			
week3			

- ✓ Library Name → week3
- Cell Name \checkmark Tool \checkmark
- \rightarrow Composer-Schematic

 \rightarrow NMOS

• Schematic 그리기

TR:NMOS_VTL Width: 0.25um Length: 0.05um

vhdl

• Layout Editor Basics

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Layout Select Window (LSW)

<shortcut< th=""><th>t></th></shortcut<>	t>
E	: Display option
I	: Instance 불러오기
С	: Сору
Μ	: Move
Shift + M	: Merge
Ctrl + D	: Deselect
Q	: Instance의 상태 확인
F	: 화면 크기 자동 조정
R	: 사각형 그리기
S	: Layer 늘이기
K	: Ruler 생성
Shift + K	: 모든 Ruler 없애기
Del	: 삭제

<알아두면 좋은 점!>

Layout Editor를 사용할 때엔 드래그 보다는 클릭 투 클릭을 사용하는 것이 좋습니다.

- $E \rightarrow Display Options$
 - ✓ Grid Controls : X snap Spacing : 0.005, Y snap Spacing : 0.005
 - ✓ Snap Modes : Create : diagonal, Edit : diagonal

Nisplay Options@itsoc2			\times
Display Controls		Grid Controls	
🗹 Open to Stop Level	Nets	Type 🔾 none 🖲 dots 🔾 lines	
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Maximum Number of Drag F	igures 500	Edit diagonal 🔽	

- Options \rightarrow Editor
 - ✓ Gravity Controls: Gravity On, Distance Large

File ~/.cdsenv

X Layout Editor Options@jisung

Defaults Apply Help

Browse...

Cancel

Save To

Load From

×

- Design Rule Check (DRC)
 - $\checkmark \quad \textbf{Calibre} \rightarrow \textbf{Run nmDRC}$

🐼 Layout L Editing: CH3 NMOS layout *

- Design Rule Check (DRC)
 - $\checkmark \quad \textbf{Calibre} \rightarrow \textbf{Run} \ \textbf{DRC}$

X Calibre Interact	ive - nmDRC v2015.1_15.11 : .runset.calibre.drc —	×
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	CALIBRE::DRC-H COMPLETED - Mon Nov 8 11:12:42 2021 TOTAL CPU TIME = 0 REAL TIME = 0 PROCESSOR COUNT = 1 SUMMARY REPORT FILE = NMOS.drc.summary	
		7

● Layout을 고친 후 다시 DRC를 수행하자!

Bulk 생성 (Pimplant, contact, metal1)

● Gate에 Metal 연결

- Label 붙이기
 - $\checkmark \quad \textbf{Create} \rightarrow \textbf{Label}$

• Layout vs Schematic (LVS) 수행

- Layout vs Schematic (LVS) 수행
 - $\checkmark \quad \textbf{Calibre} \rightarrow \textbf{Run LVS}$

💐 Calibre Interact	tive - nmLVS v2015.2_19.13 : .runset.calibre.lvs – 🗆 🗙
<u>F</u> ile <u>T</u> ranscript	Setup <u>H</u> elp
Rules	Run: Hierarchical -
Inputs	Step: Layout vs Netlist
Outputs	
Run <u>C</u> ontrol	Layout Netlist H-Cells Signatures Waivers
Tr <u>a</u> nscript	Format: GDSII - Export from layout viewer
Run <u>L</u> VS	
	Layout File: NMOS.calibre.db
Start R <u>∨</u> E	Top Cell: NMOS
	Layout Netlist: NMOS.sp View

- Layout vs Schematic (LVS) 수행
 - \checkmark Setup \rightarrow LVS Options \rightarrow Connect tap \rightarrow Connect all nets by name

💐 Calibre Interac	tive - nmLVS v2015.2_19.13 : .runset.calibre.lvs – 🛛 🗘	×
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<u>R</u> ules <u>Inputs</u> <u>Outputs</u> LVS Options Run <u>C</u> ontrol	Supply Report Gates Shorts ERC Connect Include Database Pr Connect nets with colon (:) Don't connect nets by name Connect all nets by name Connect nets named: Connect nets named: Connect nets named: Connect nets named: Connect nets named: Connect nets named: Connect nets named: Connect nets named: Connett nets named: Connett n	op
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Start R <u>V</u> E		
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● Layout vs Schematic (LVS) 수행

● Layout vs Schematic (LVS) 수행

Homework

- PMOS/NMOS layout & DRC & LVS
- ✓ PMOS W=5u, L=0.3u
- ✓ NMOS W=2u, L=0.5u

	NMOS	PMOS
Well	PWELL	NWELL
Implant (Transistor)	Nimplant	Pimplant
Implant (Bulk Contact)	Pimplant	Nimplant

- 1) 레이아웃 캡쳐
- 2) DRC 에러없는 화면 캡쳐
- 3) LVS CORRECT 화면 캡쳐