上海交通大学
SHANGHAI JIAO TONG UNIVERSITY

Final project

Due: June 14th

电子版pdf格式发至邮箱：luojing@sjtu.edu.cn

纸质版上课时交给助教

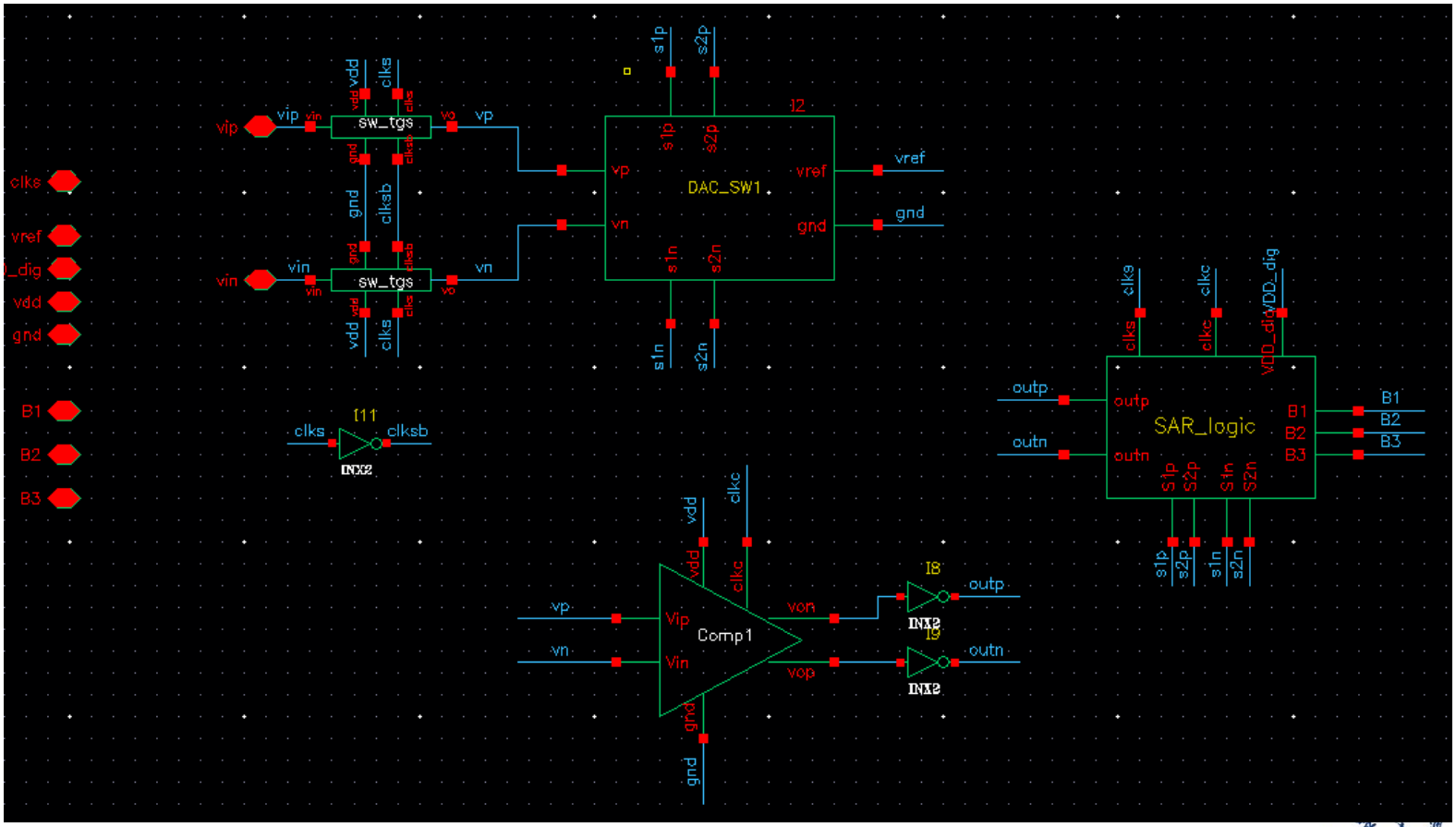
Presentation at 14:00-15:40, June 14th

Outline

- 3-bit 50MSPS SAR ADC
  - Structure
  - Your task
- 2-stage OPA
  - Structure
  - Your task
- Choose the one you want to do!

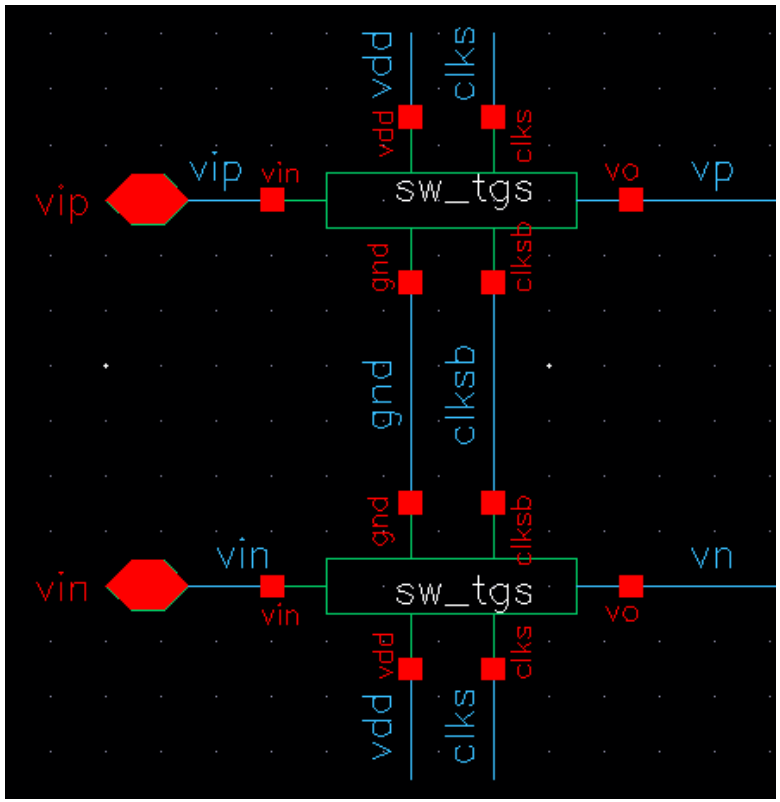
3-bit SAR ADC

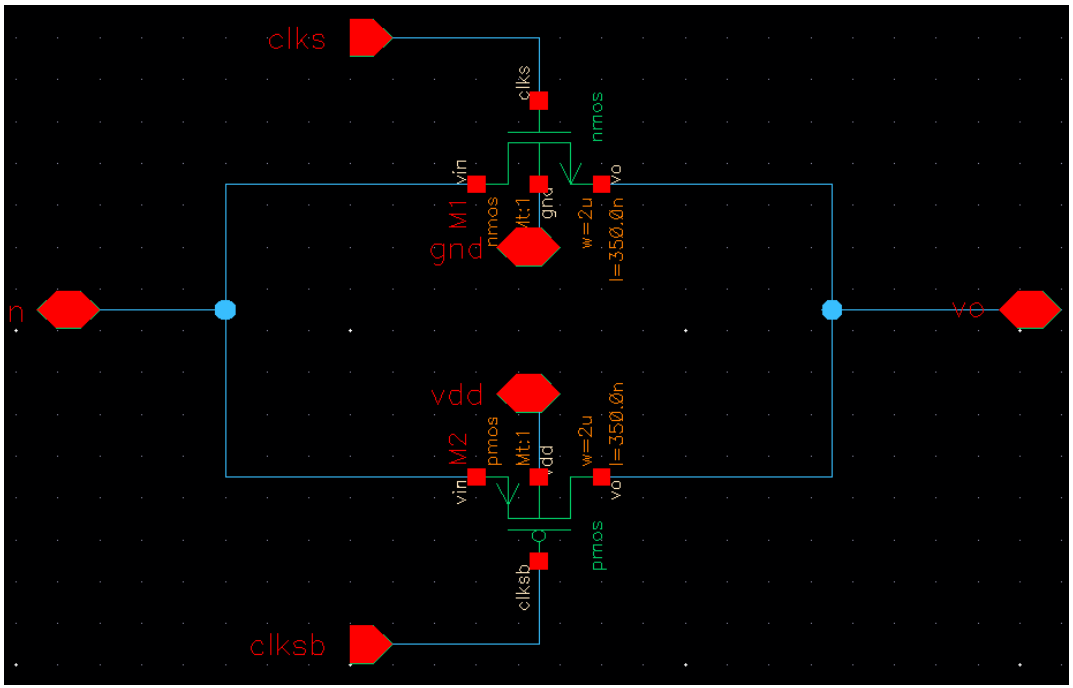
- Structure of SAR ADC
- Sample and hold, Capacitive DAC, Comparator and SAR logic



3-bit SAR ADC

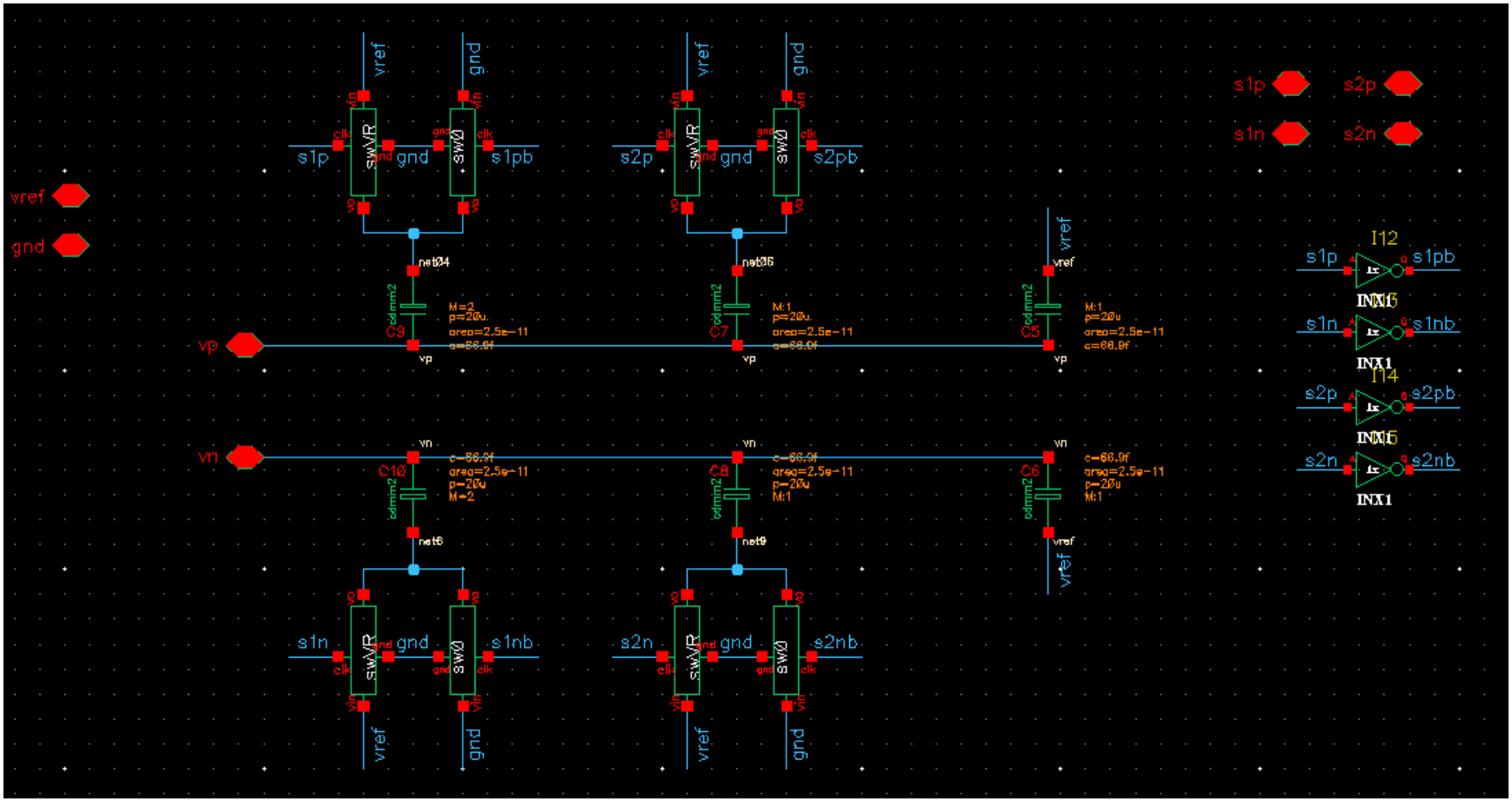
- Sample and hold — transmission gate





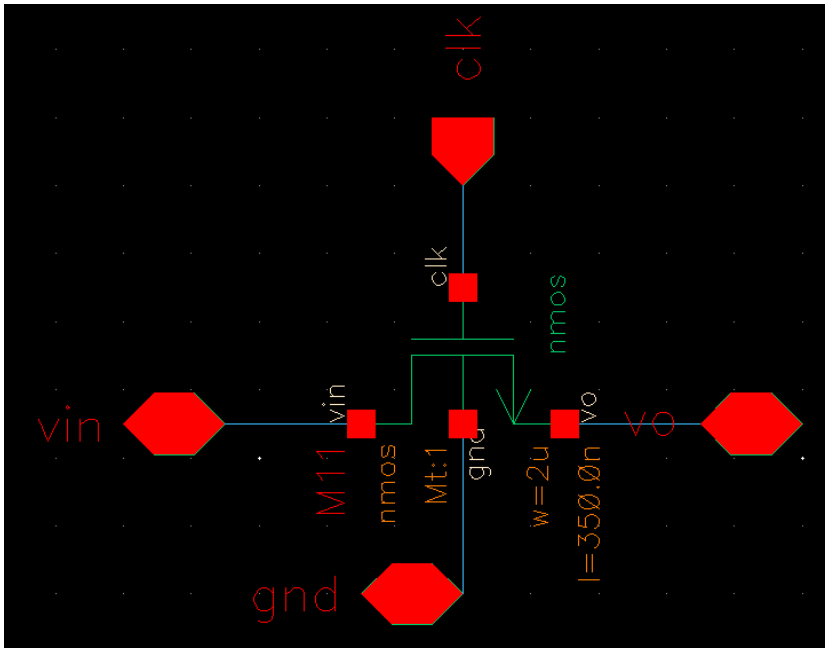
3-bit SAR ADC

- Capacitive DAC — unity cap 66.9fF, sw0, swVR

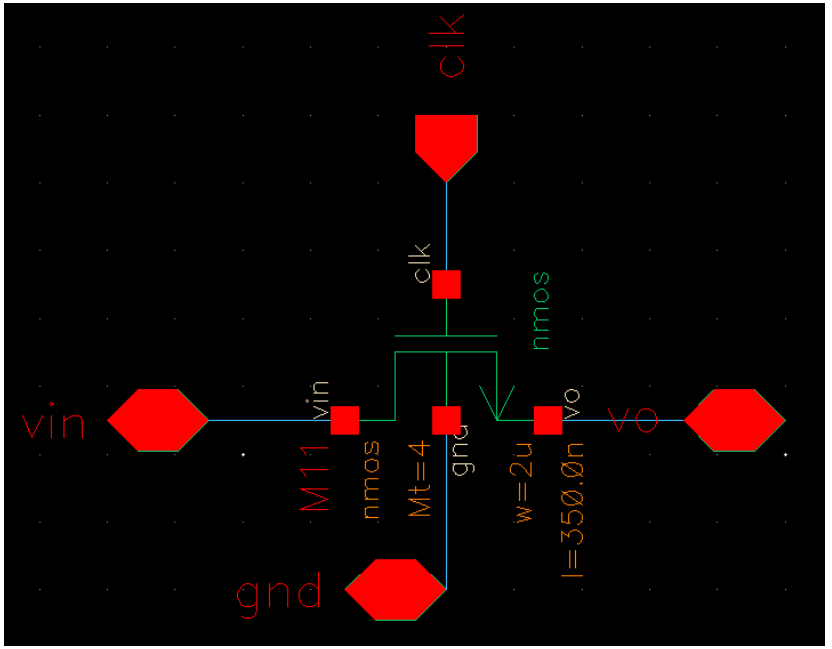


3-bit SAR ADC

- sw0,

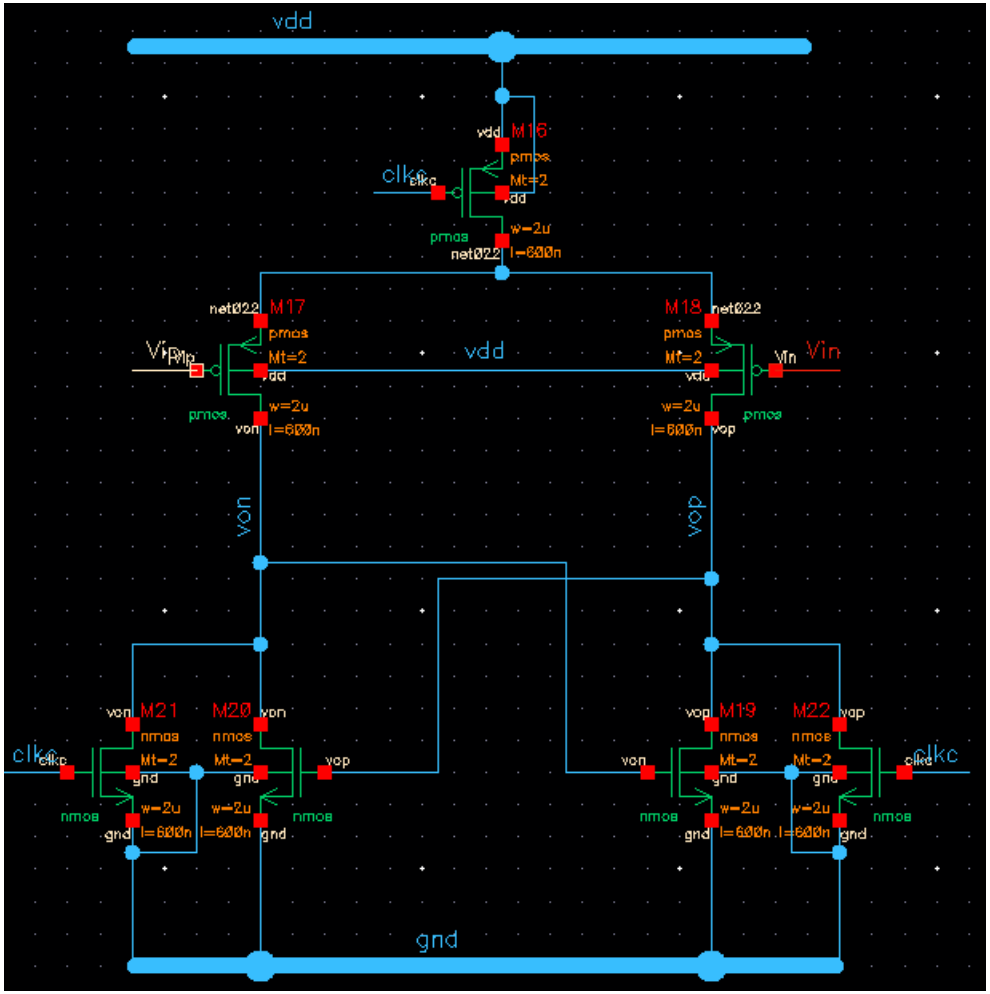


swVR



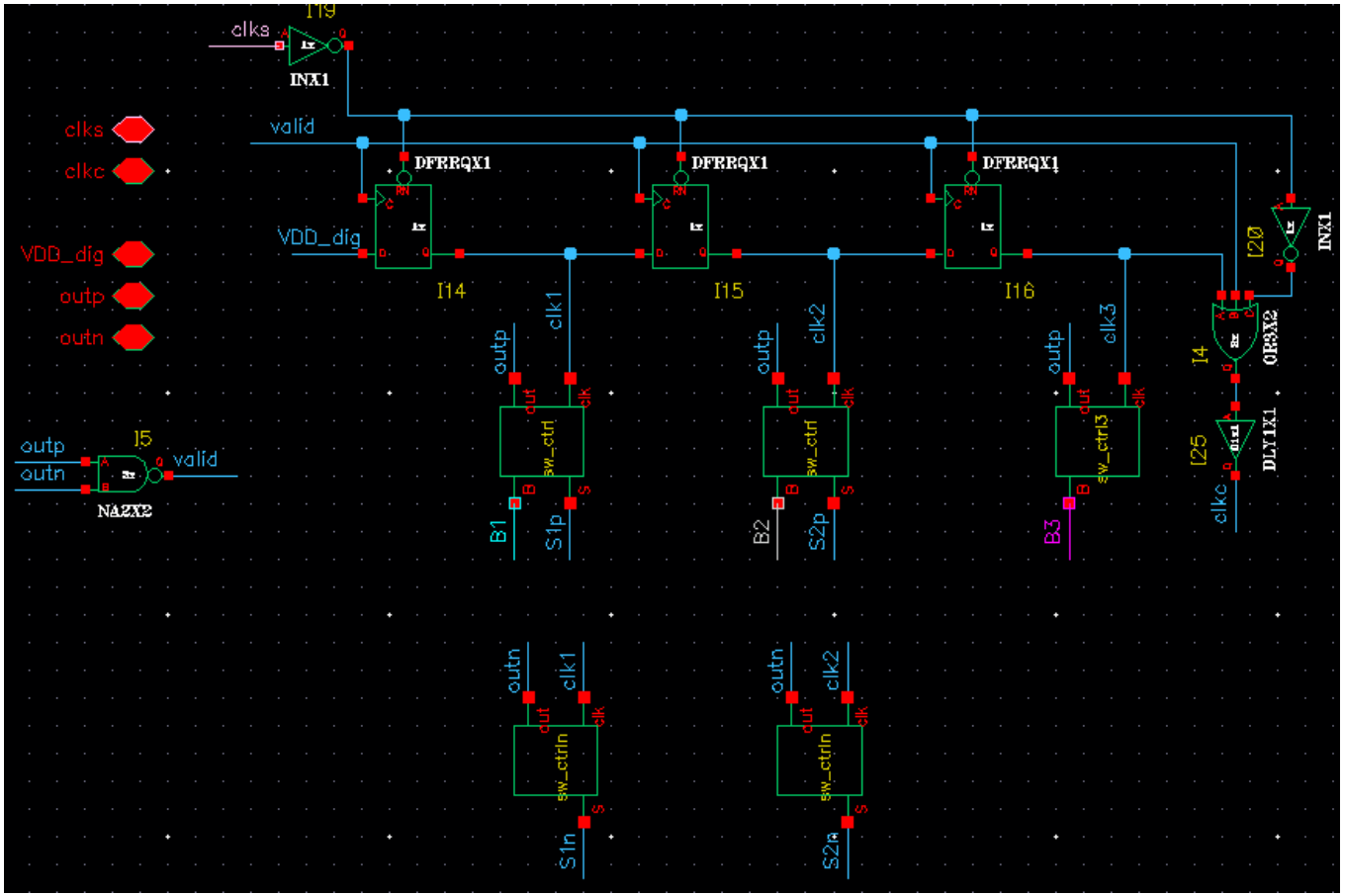
3-bit SAR ADC

- Comparator



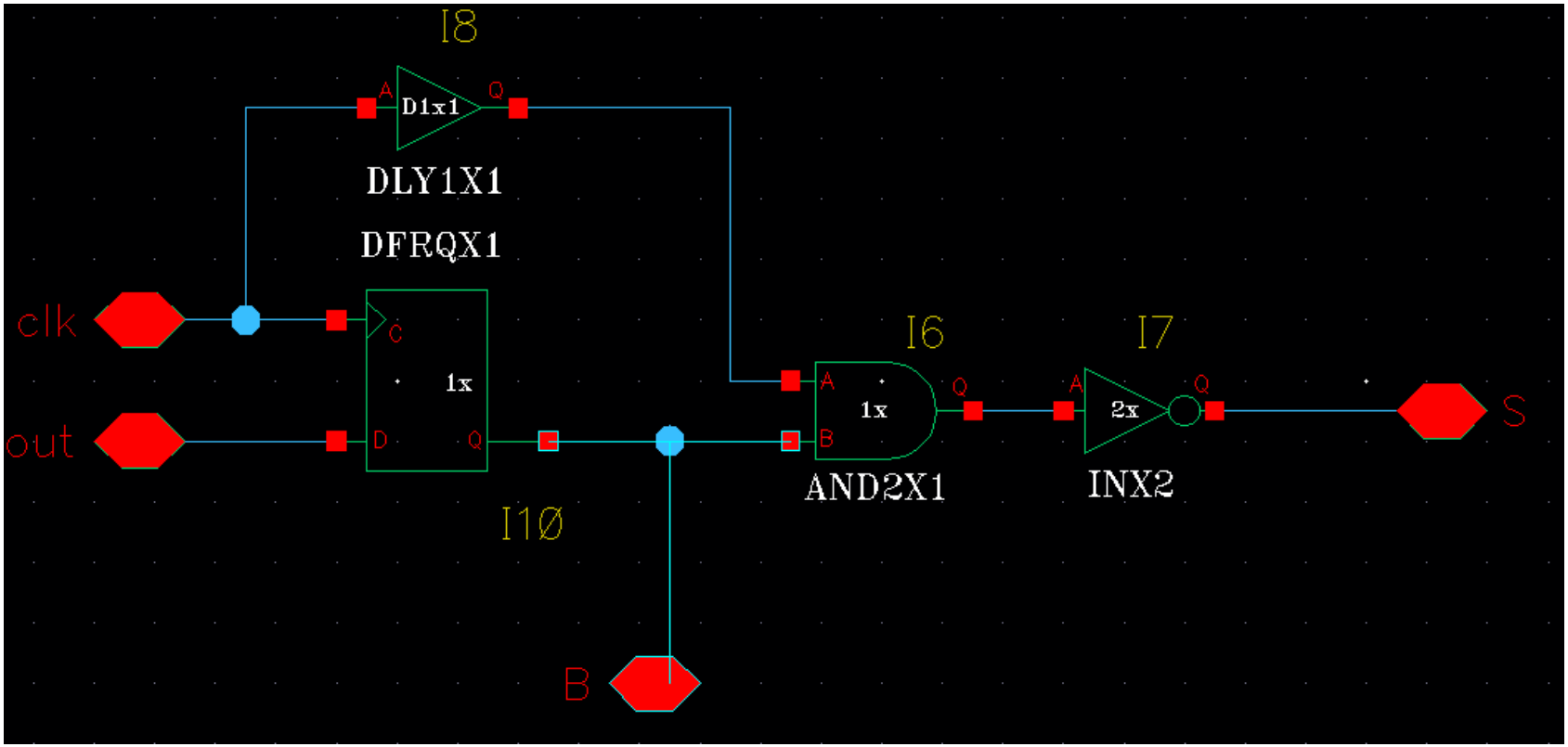
3-bit SAR ADC

- SAR logic — INX, NAND, OR, DFF, sw_ctrl, sw_ctrl3, sw_ctrln



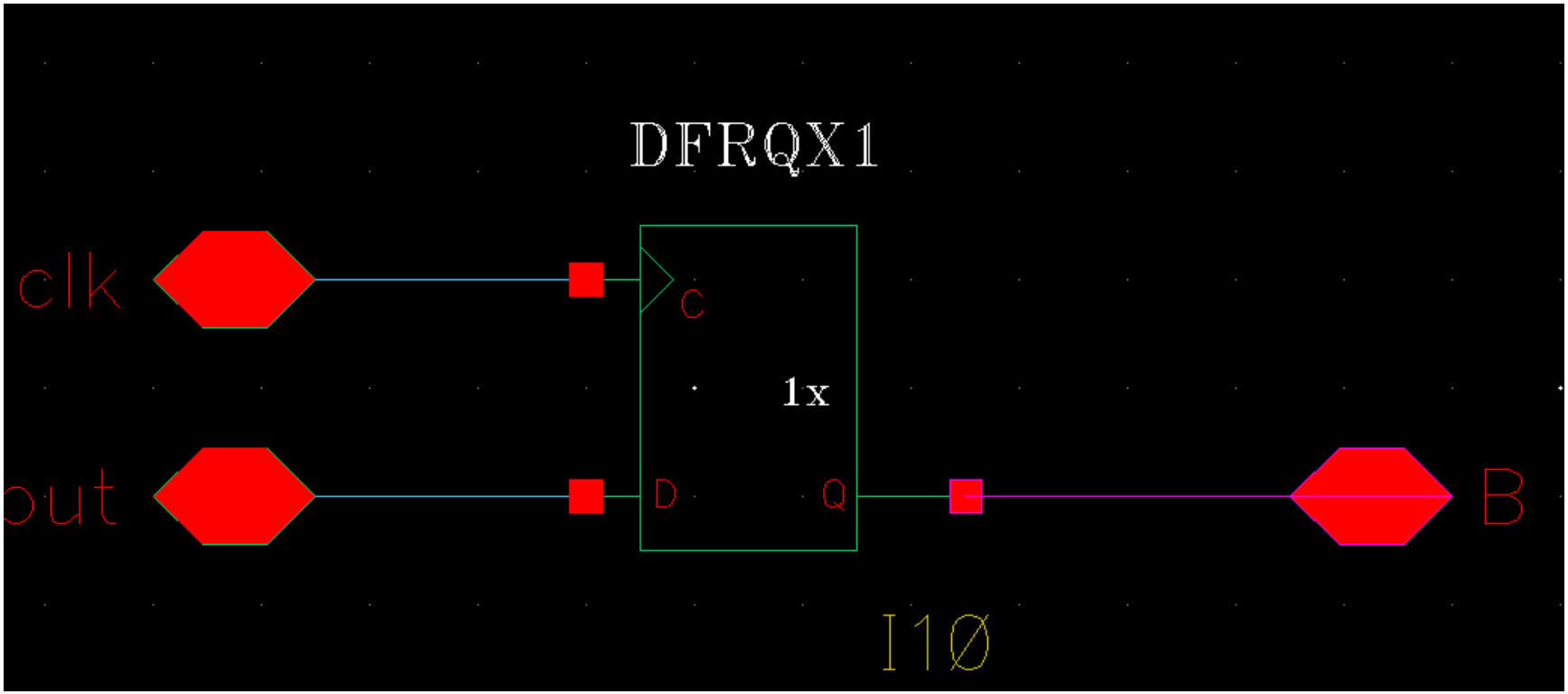
3-bit SAR ADC

- sw_ctrl



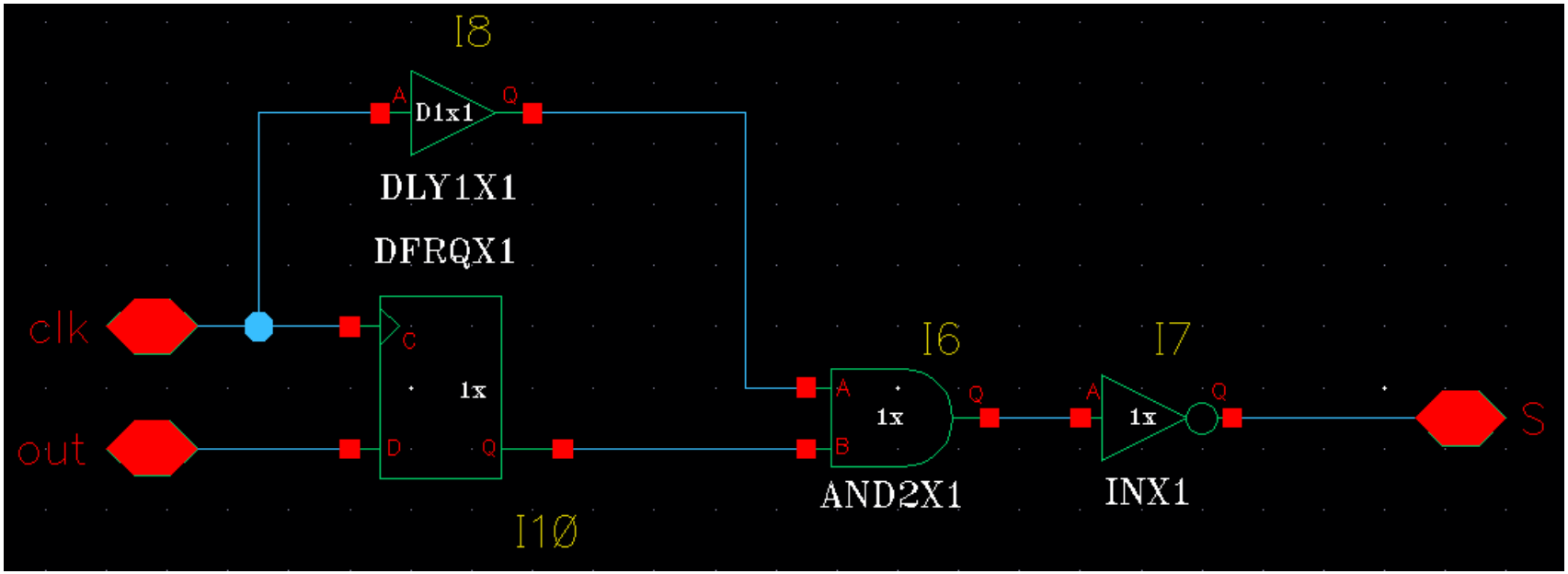
3-bit SAR ADC

- sw_ctrl3



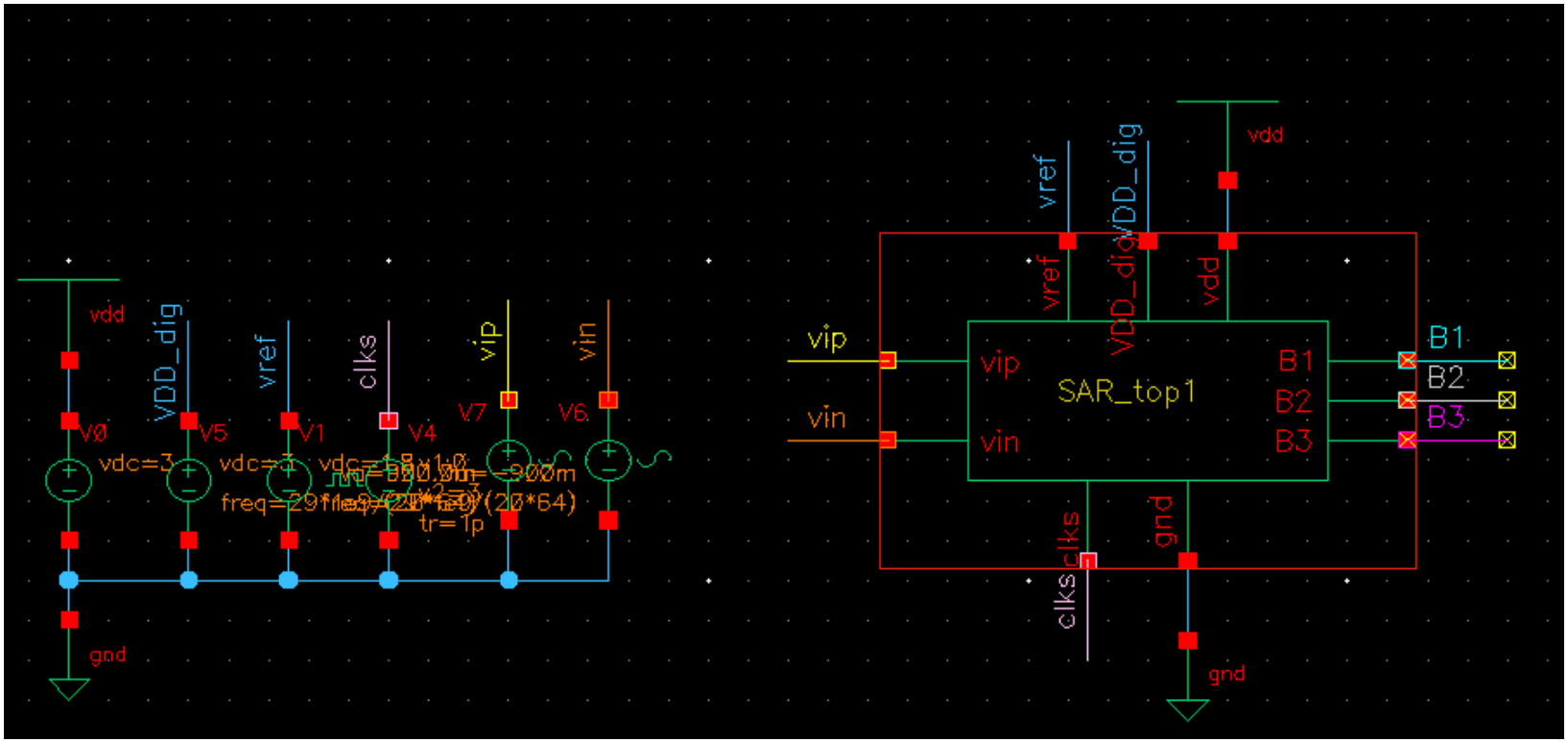
3-bit SAR ADC

- sw_ctrln



3-bit SAR ADC

- Testbench



Vdd=3V, VDD_dig=3V, vref=1.8V

3-bit SAR ADC

- Testbench

Voltage 1	0 V
Voltage 2	3 V
Period	20n s
Delay time	2n s
Rise time	1p s
Fall time	1p s
Pulse width	8n s

clks

DC voltage	900.0m V
AC magnitude	
AC phase	
XF magnitude	
PAC magnitude	
PAC phase	
Delay time	0 s
Offset voltage	
Amplitude	900.0m V
Initial phase for Sinusoid	
Frequency	29*1e9/(20*64) Hz

vip

DC voltage	900.0m V
AC magnitude	
AC phase	
XF magnitude	
PAC magnitude	
PAC phase	
Delay time	0 s
Offset voltage	
Amplitude	-900m V
Initial phase for Sinusoid	
Frequency	29*1e9/(20*64) Hz

vin

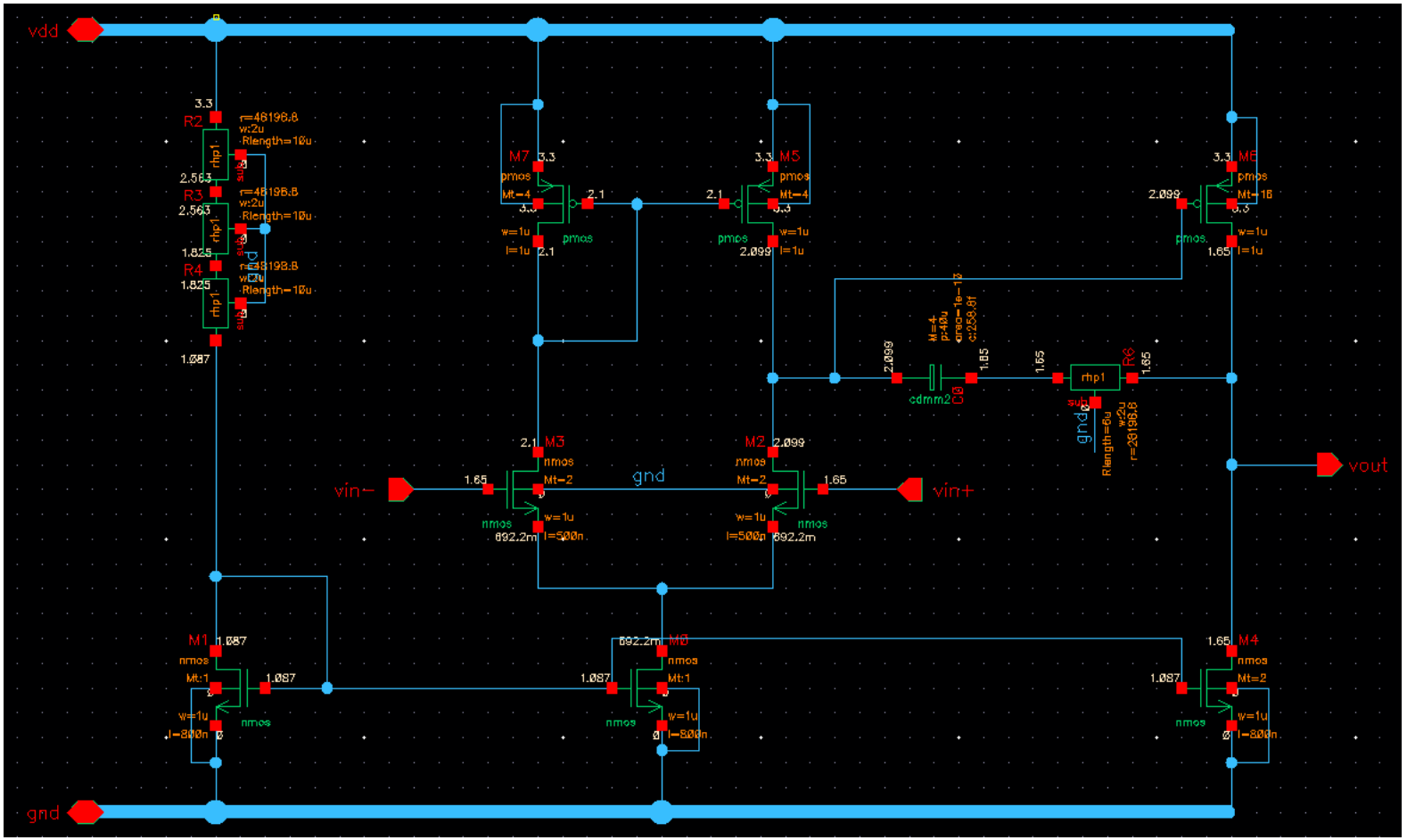
3-bit SAR ADC

- Your task

  - Draw the schematic of SAR ADC
  - Do tran pre-simulation and calculate SNDR
  - Draw the layout
  - Do tran post-simulation and calculate SNDR
  - Compare the results and discuss carefully

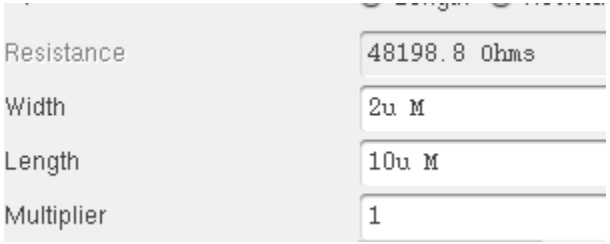
2-stage OPA

- Structure of OPA



2-stage OPA

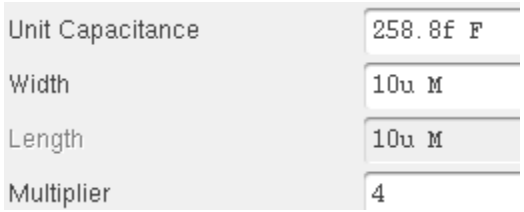
- Structure of OPA
- Resistor:



Rhp1 for bias

Rhp1 for miller compensation

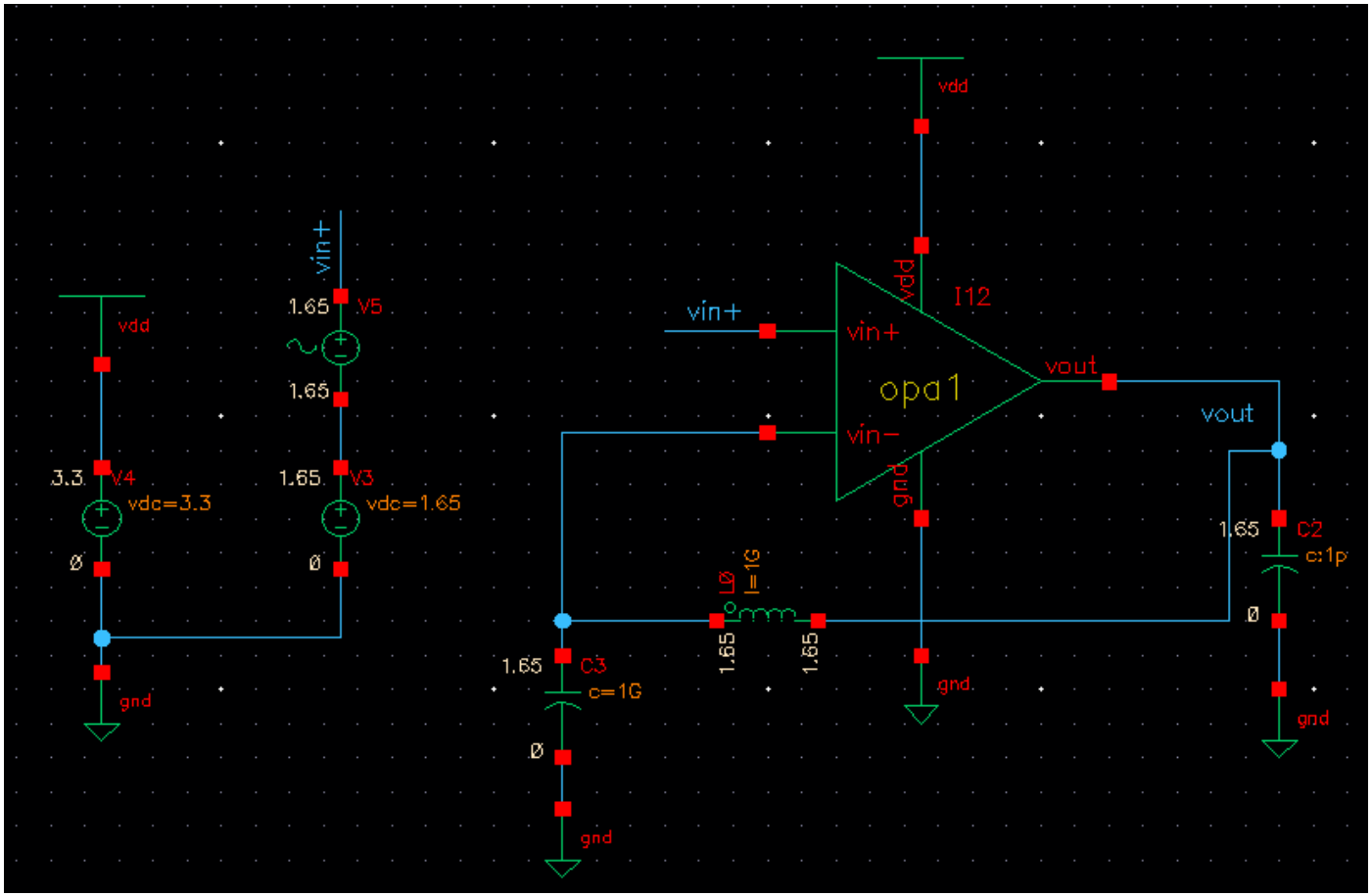
- Capacitor:



cdmm2

2-stage OPA

- Testbench



2-stage OPA

- Your task

  - Draw the schematic of OPA
  - Do pre-simulation and calculate DC gain, PM, GBW (in different PVTs)
  - Do monte-carlo pre-simulation
  - Draw the layout
  - Do post-simulation and calculate DC gain, PM, GBW (in different PVTs)
  - Do monte-carlo post-simulation
  - Compare the results and discuss carefully

Thanks!