Design Review

FLASH ADC

UNIVERSIDAD TECNICA
FEDERICO SANTA MARIA

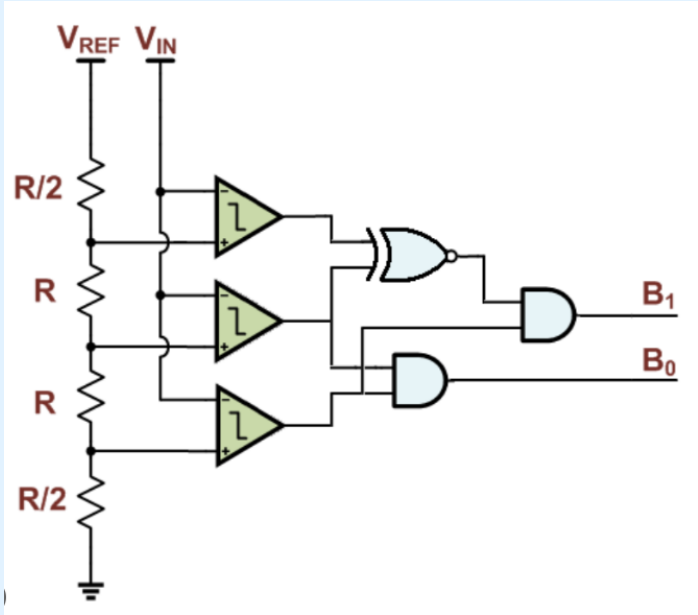
Alan Rivera
15-12-2023

Especificaciones

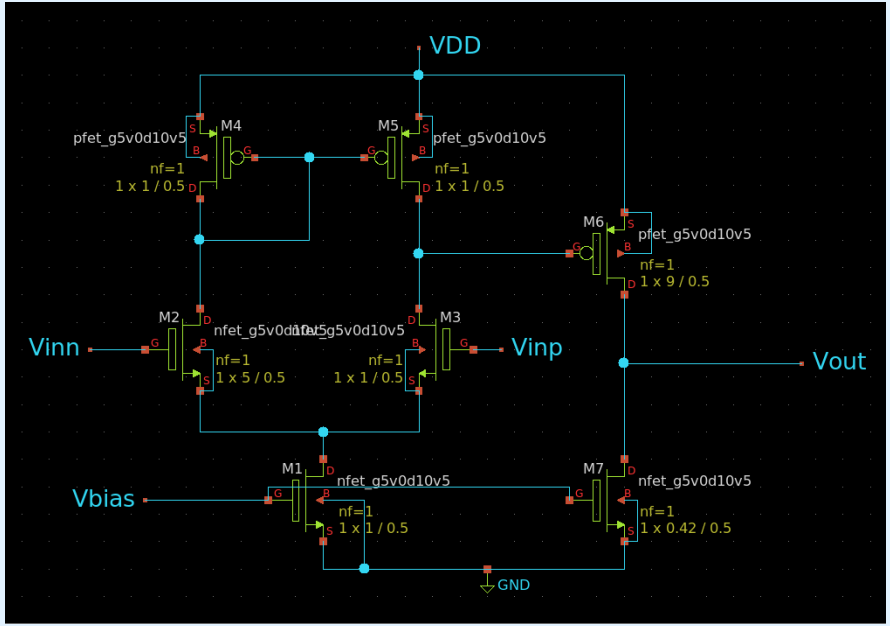
Referencias:

- Flash ADC Behzad Razavi
- https://www.electronics-tutorial.net/analog-integrated-circuits/data-converters/flash-type-adc/
- https://www.semanticscholar.org/paper/Low-Power-and-High-Speed-CMOS-Comparator-for-A-D-A-Kumari-Kumar/7074d7ad974dc4933a87081948ba5e3980702a64

Flash ADC

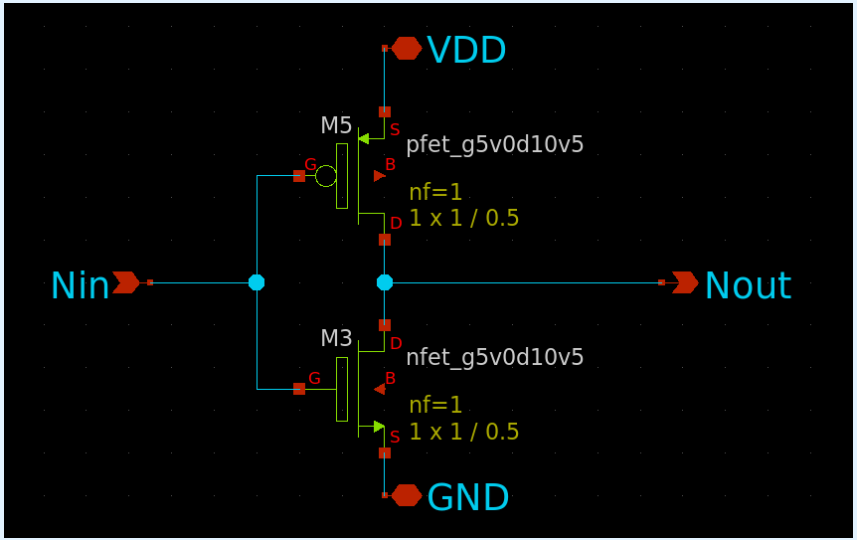


Comparador

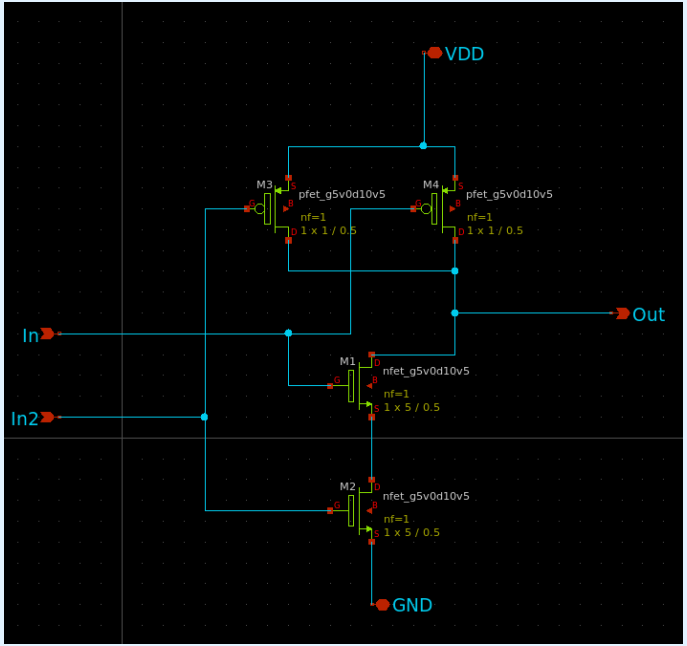


Codificador

- Inversor.



- Nand.



Sensor infrarrojo – Señal Analógica

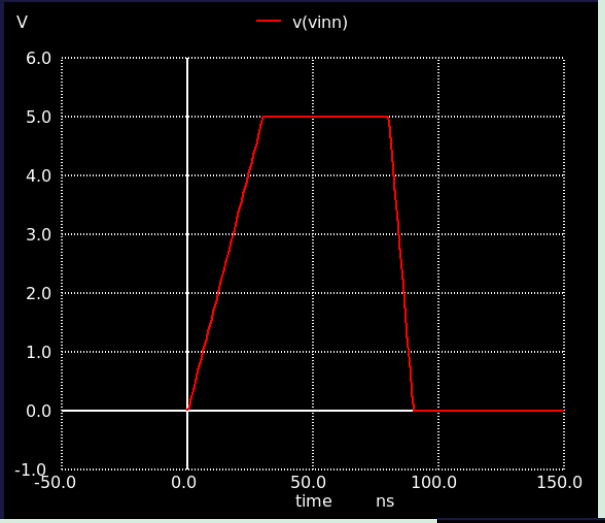
- Sensor de Proximidad Infrarrojo IR Modelo E18-D80NK Versión S
- 5V

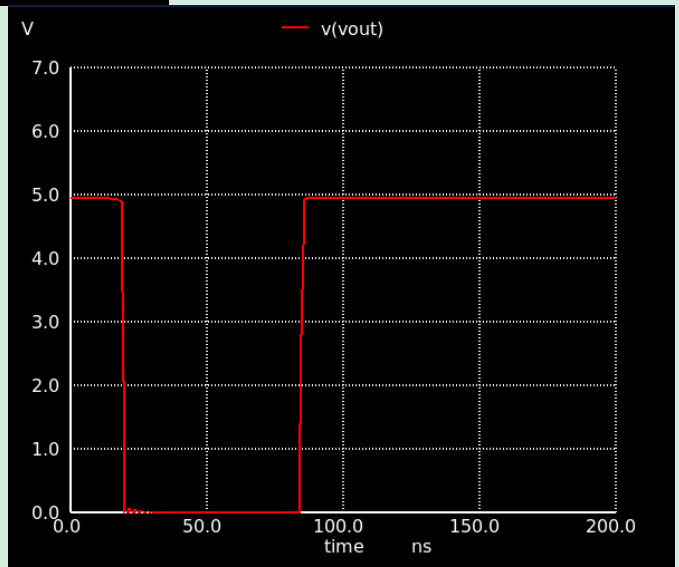
Sensor → Comparadores → Codificador → Bits

Especificaciones

Señal del sensor	**0v – 5v**
Transistores	5v
VDD	5v
Vref	5v

Simulación

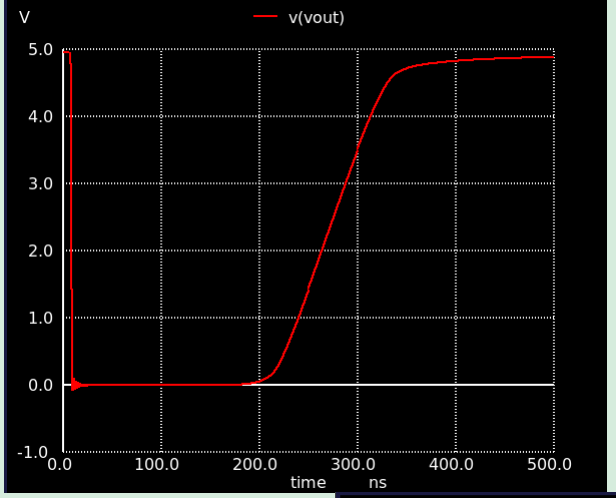




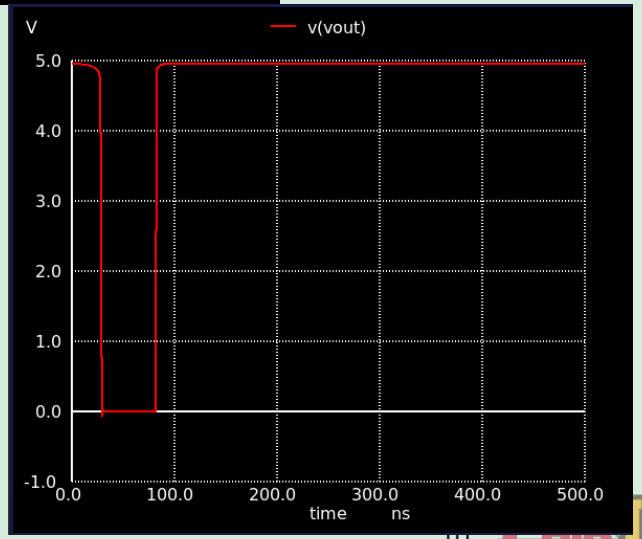
Comparador:

- Vref = 3V
- Vbias = 1V
- Transistores genéricos.
- Señal variable.

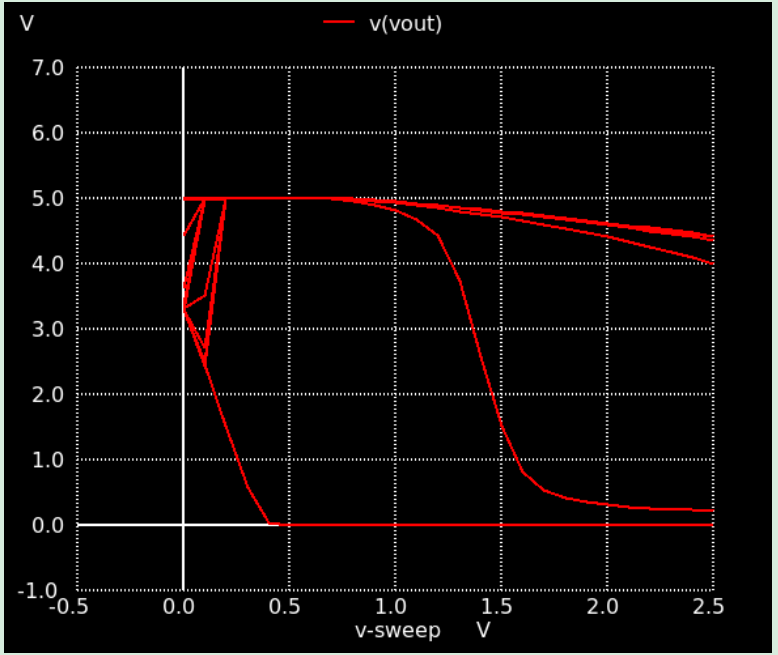
- Vref = 0.5
- Vref = 4.5



- Vbias.
- Tamaño de transistores.

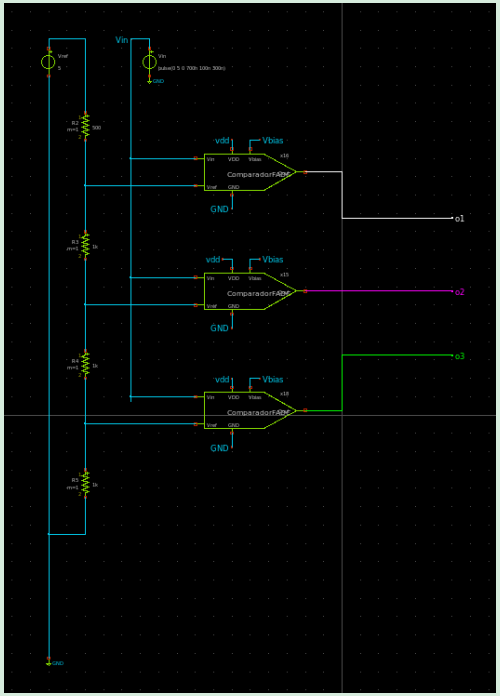


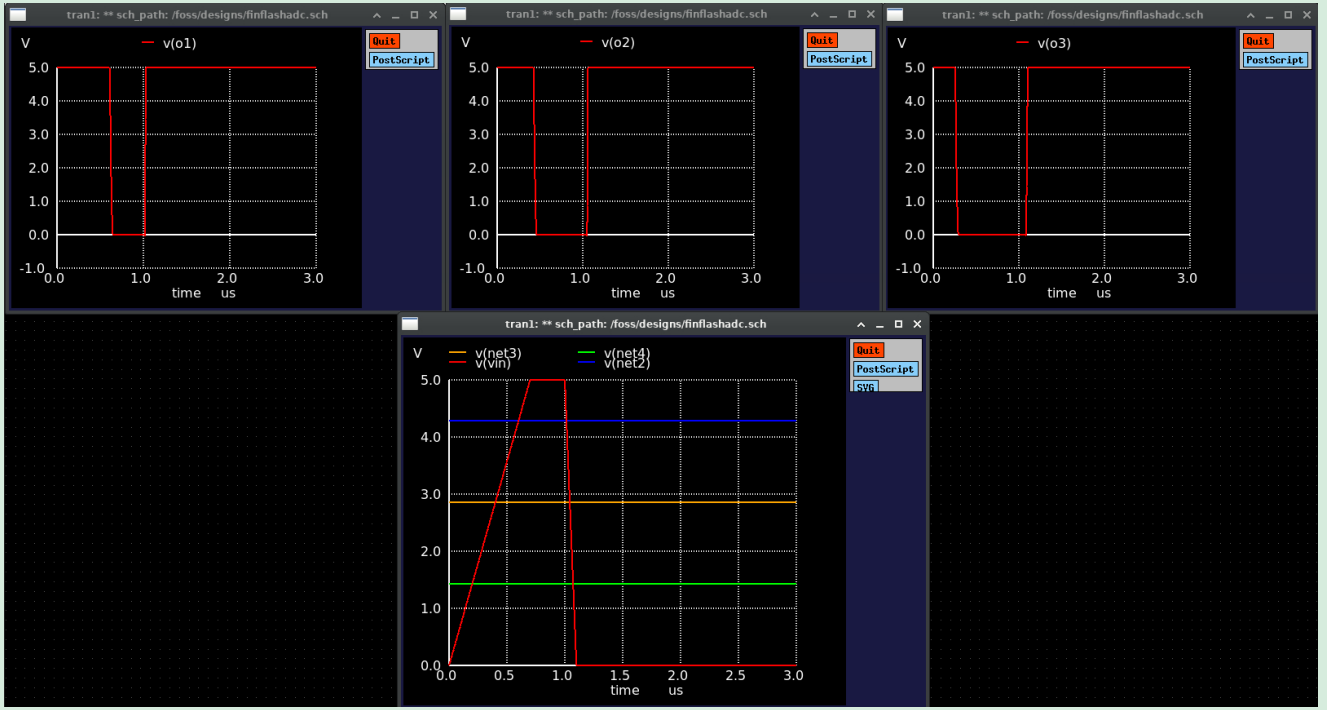
- Encontrar un Vbias adecuado
- Variar Vbias y Vref en simulación dc.

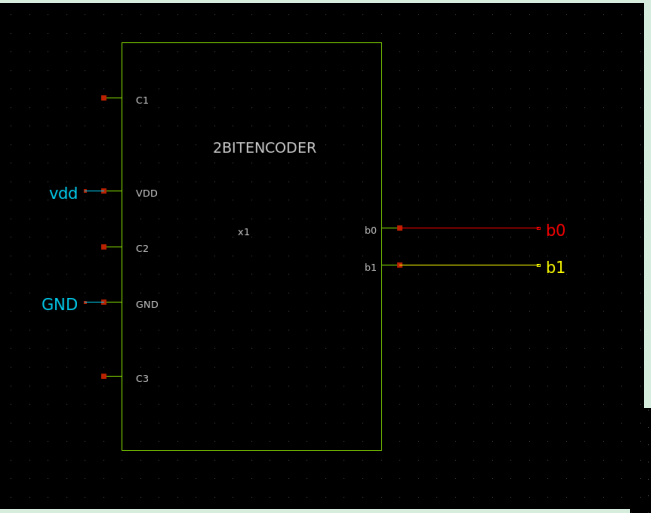


- Vbias entre 0.4 a 0.8

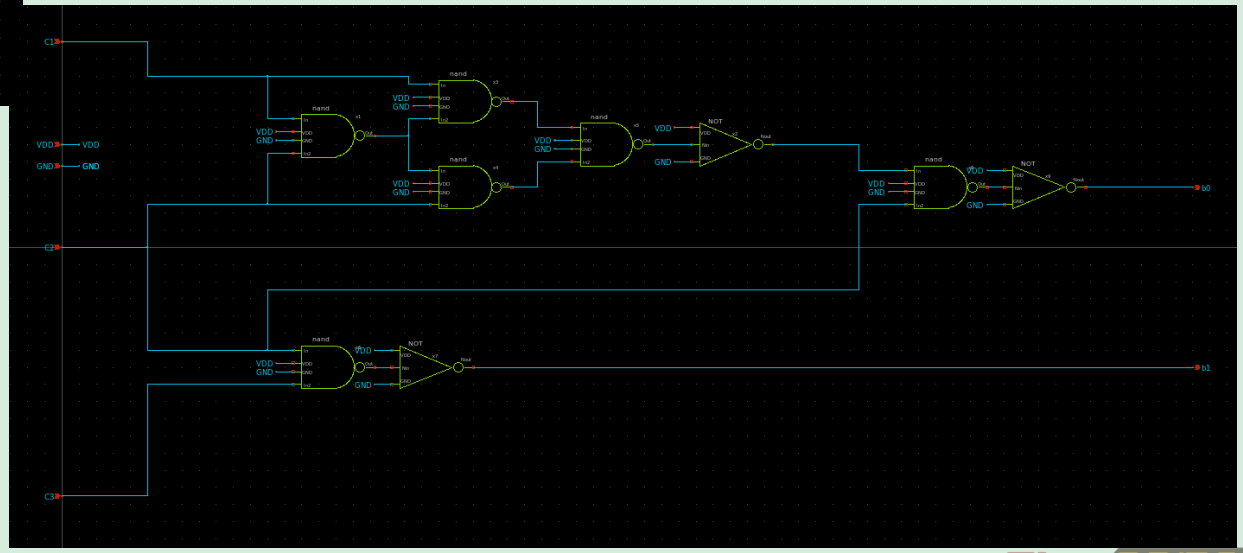
Comparadores en uso:



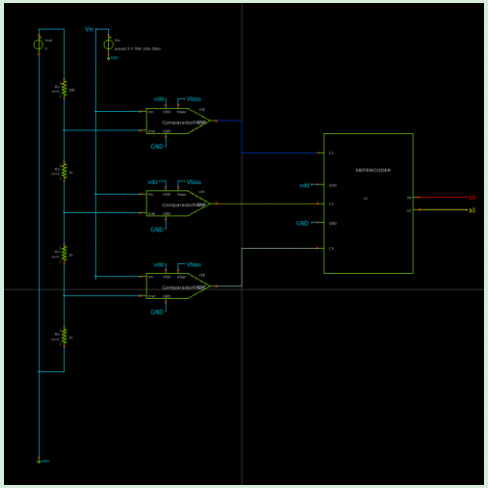


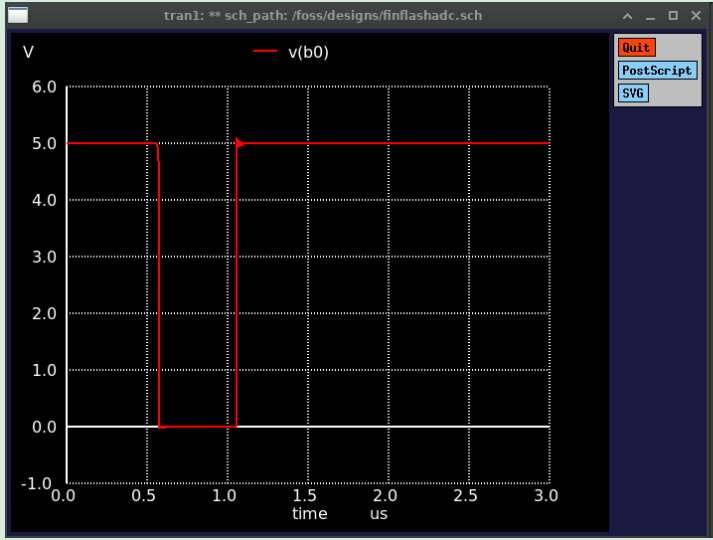


Codificador de 2 bits:



- XNOR
- AND

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V
v(b0)
Quit
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SVG
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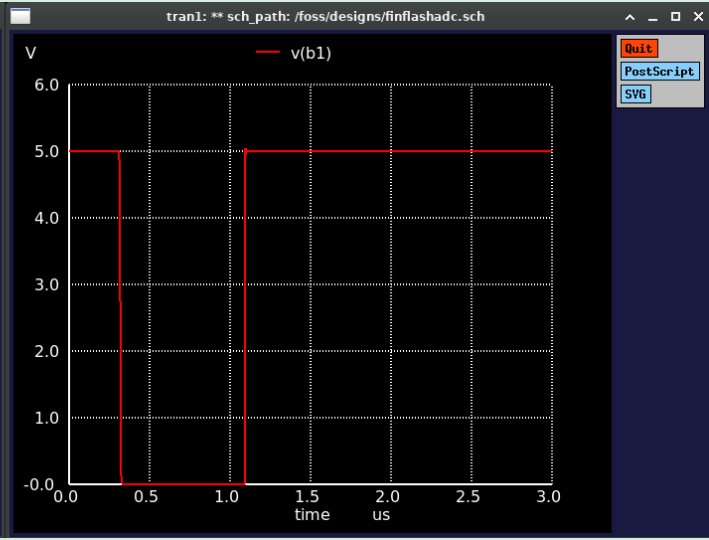
time
us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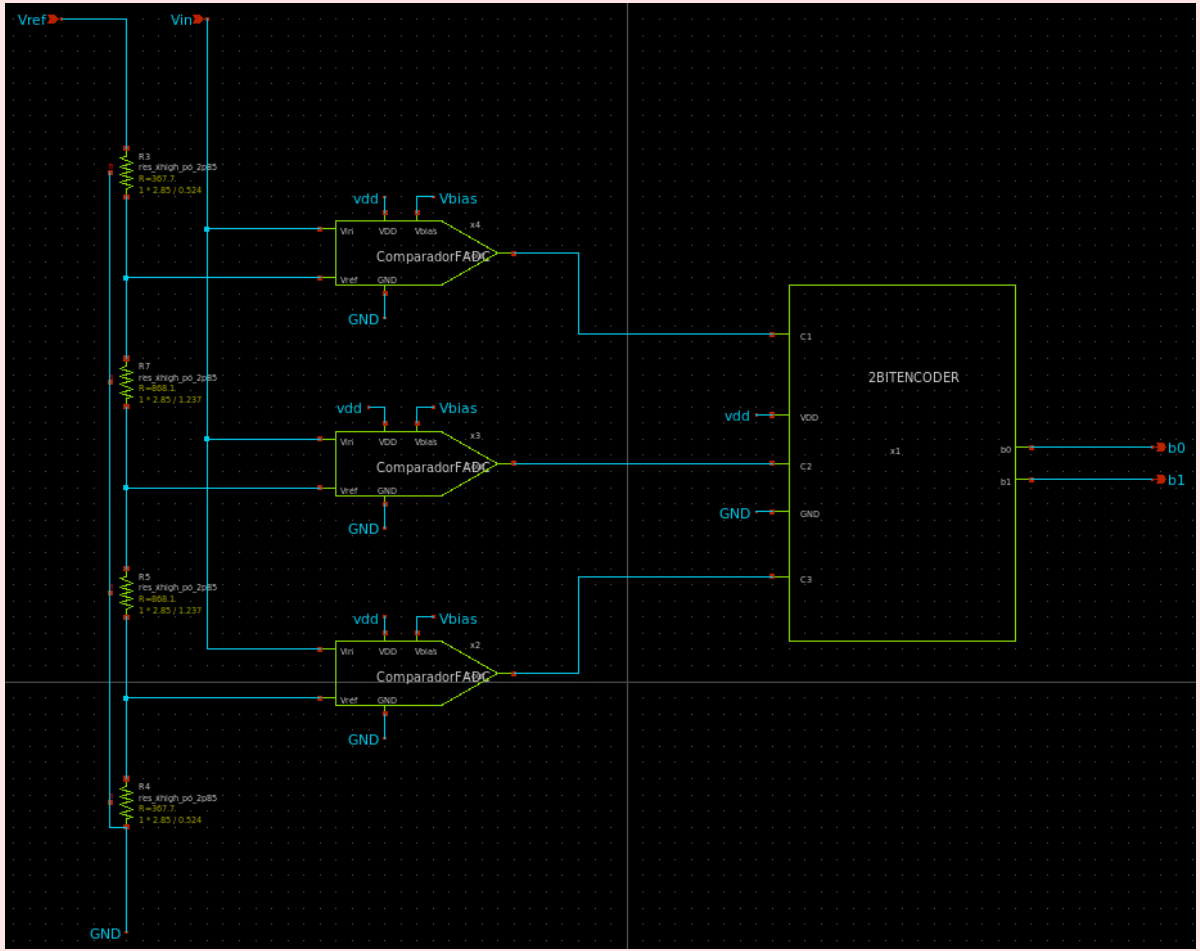
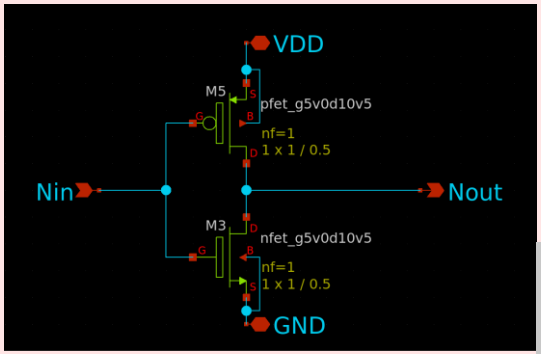
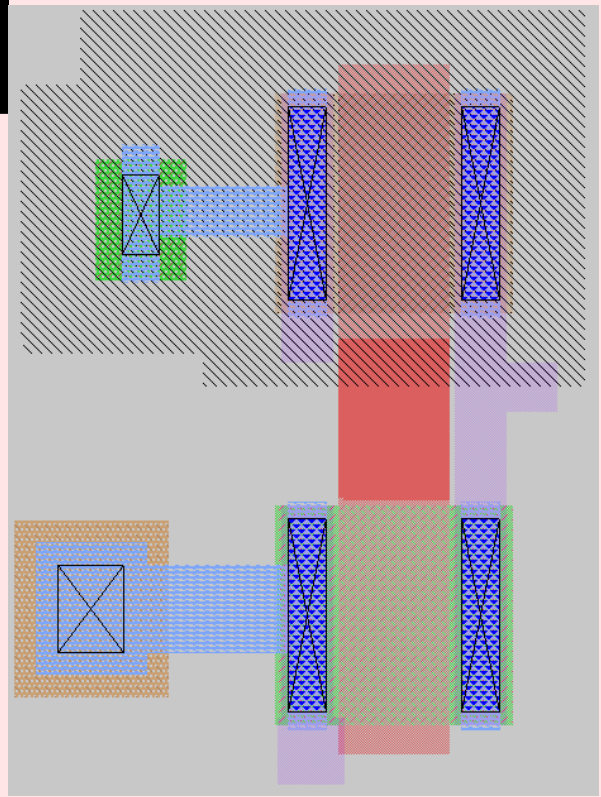
time
us

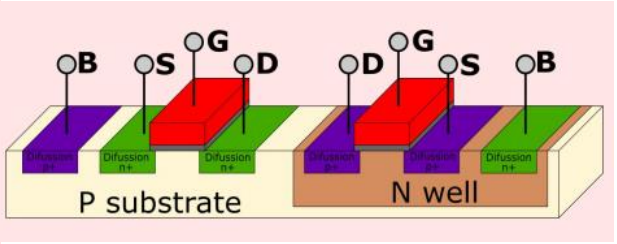
Layout

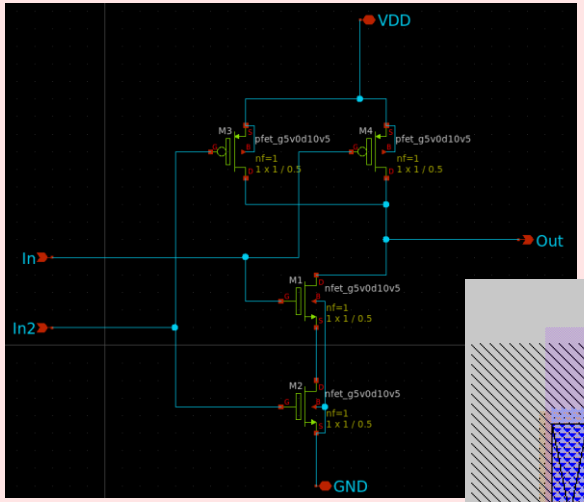

Vref
Vin
R3
res_xhigh_po_2p85
R=367.7
1 * 2.85 / 0.524
vdd
Vbias
Viri
VDD
Vbias
x4
ComparadorFADC
Vref
GND
GND
R7
res_xhigh_po_2p85
R=868.1
1 * 2.85 / 1.237
vdd
Vbias
Viri
VDD
Vbias
x3
ComparadorFADC
Vref
GND
GND
R5
res_xhigh_po_2p85
R=868.1
1 * 2.85 / 1.237
vdd
Vbias
Viri
VDD
Vbias
x2
ComparadorFADC
Vref
GND
GND
R4
res_xhigh_po_2p85
R=367.7
1 * 2.85 / 0.524
GND
C1
2BITENCODER
vdd
VDD
x1
C2
GND
GND
C3
b0
b1
b0
b1

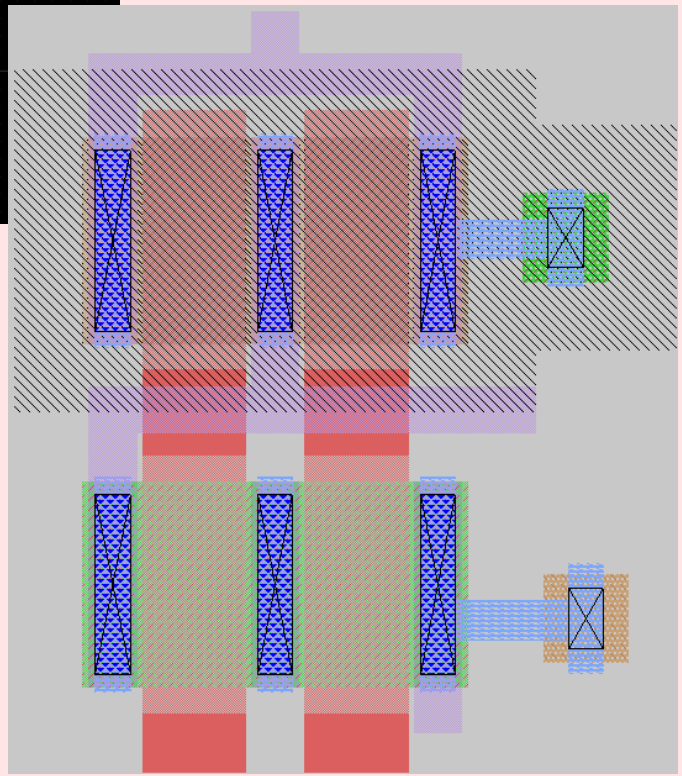
Compuerta NOT



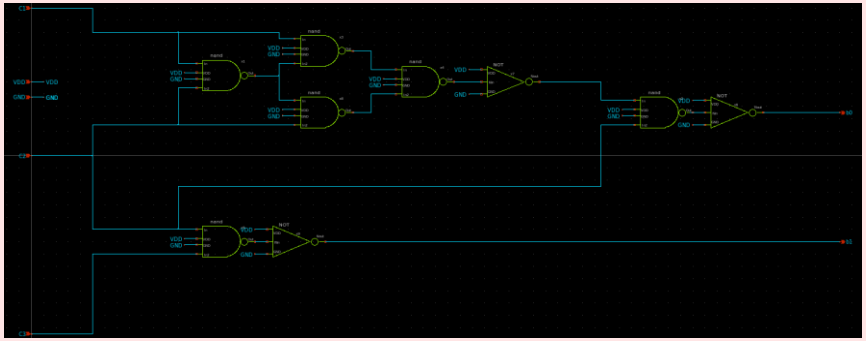


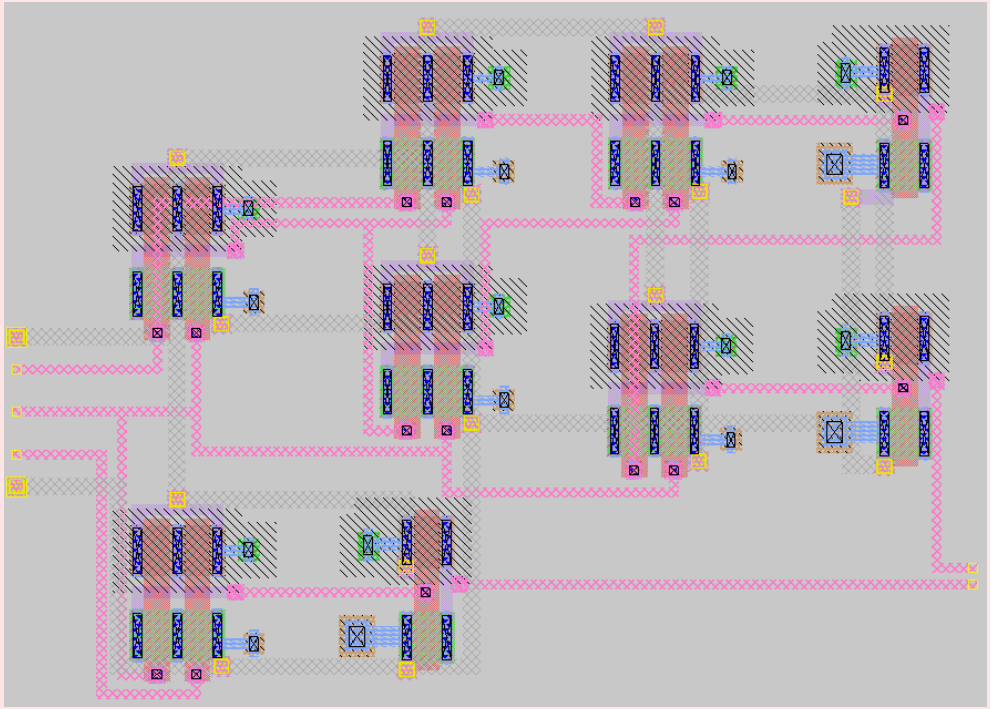






Compuerta NAND



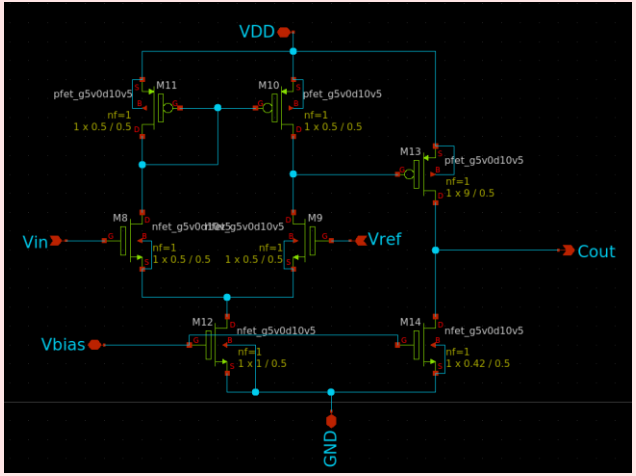


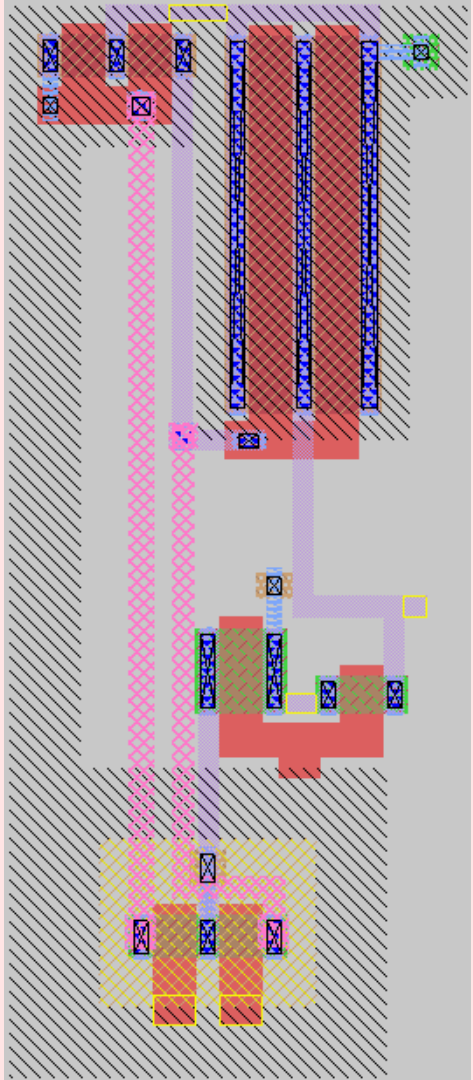
Codificador de 2 bits

- Diseño mejorable

Comparten Bulk.

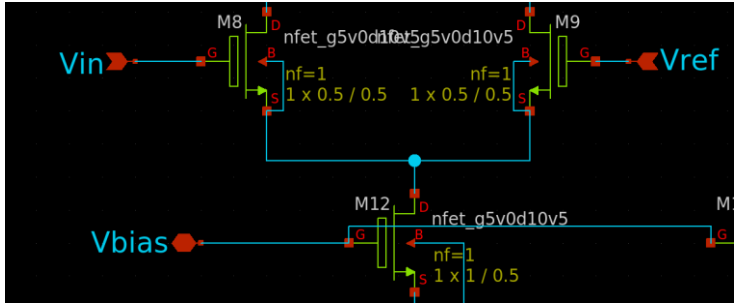
NAND y NOT Idénticos.

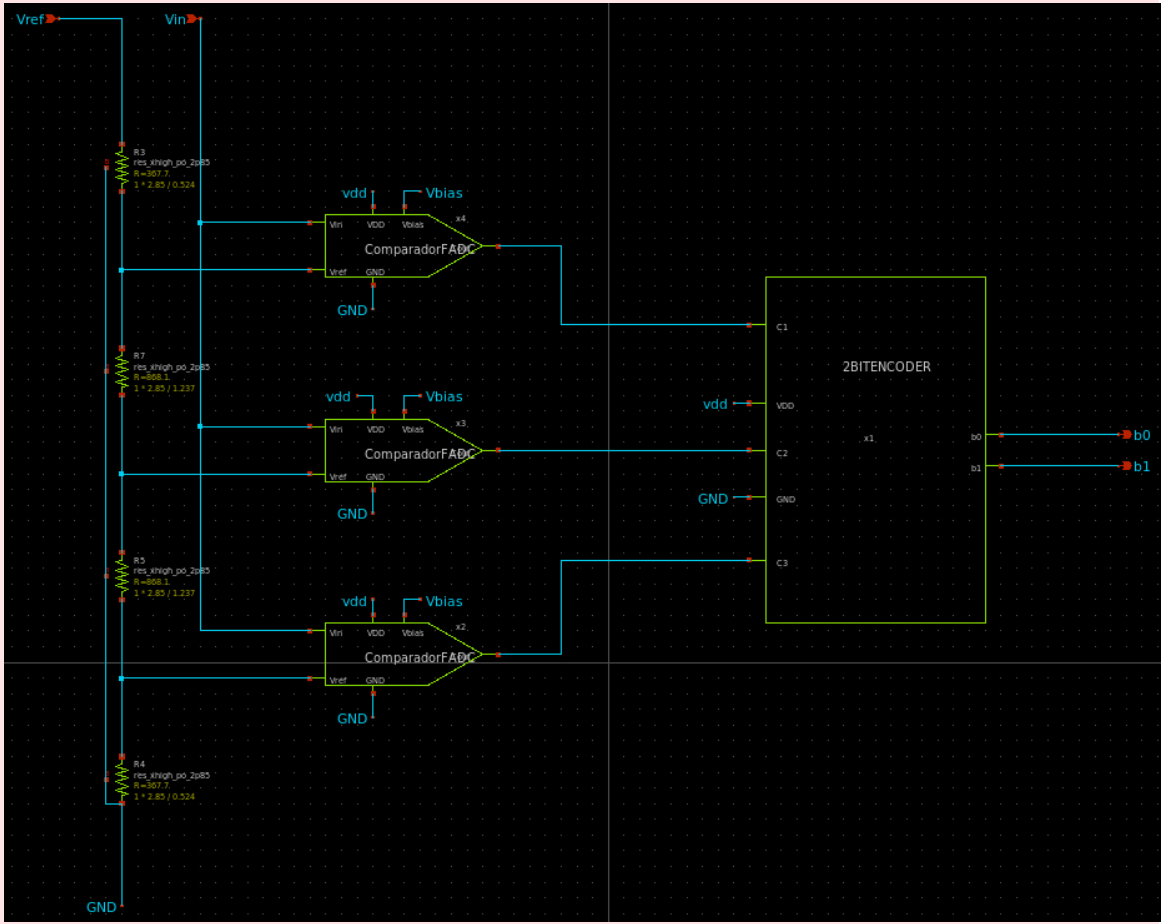




Comparador

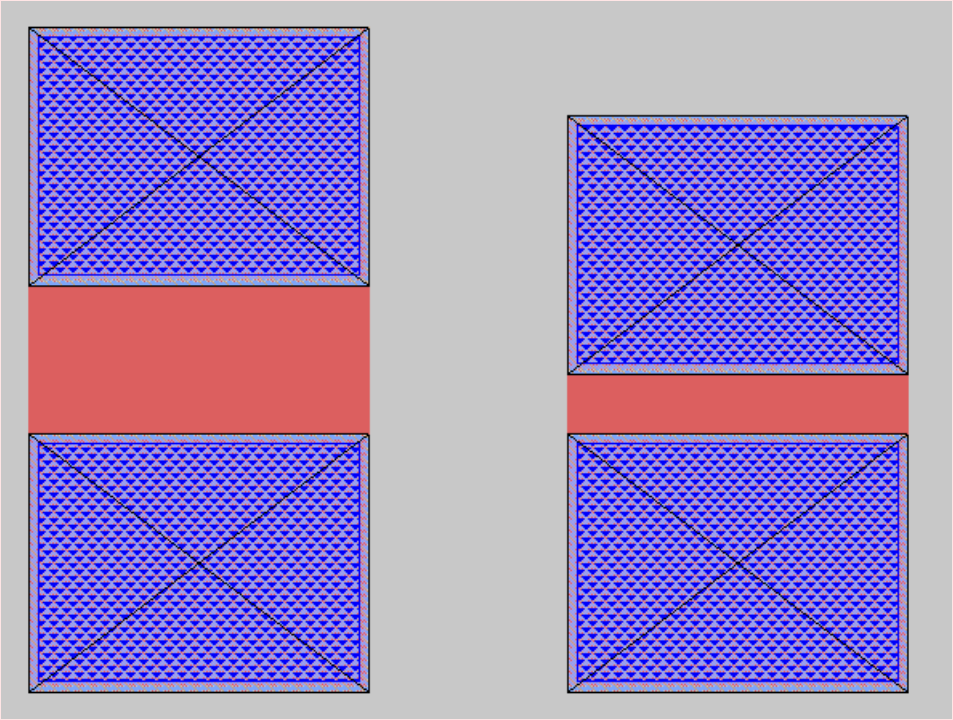
- Fingers.
- Aislación de transistores NFET.





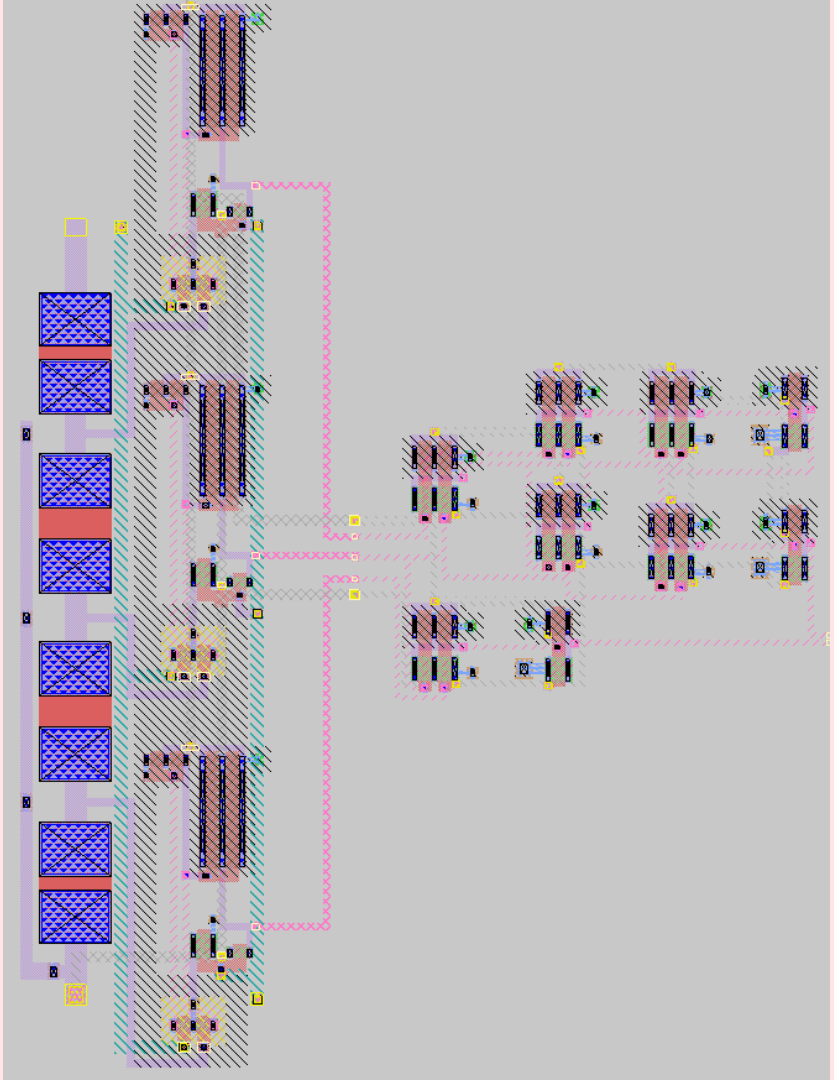
Esquemático FLASHADC

- Resistencias



Resistencias
w = 2.85

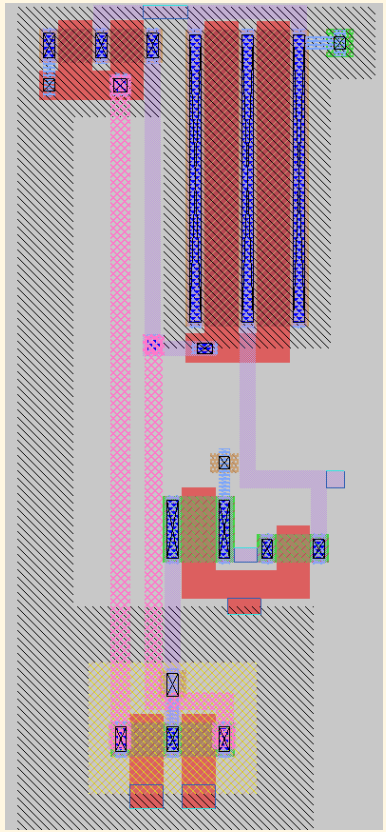
- 1000 ohm L = 1.237
- 500 ohm L = 0.524

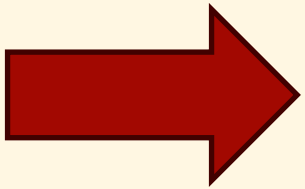


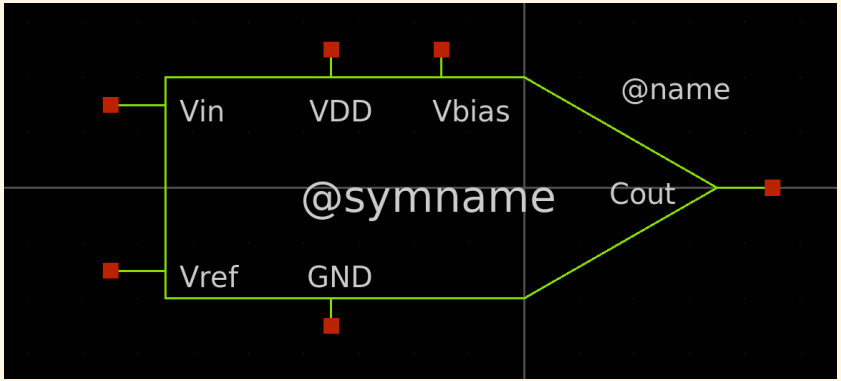
Layout FLASHADC

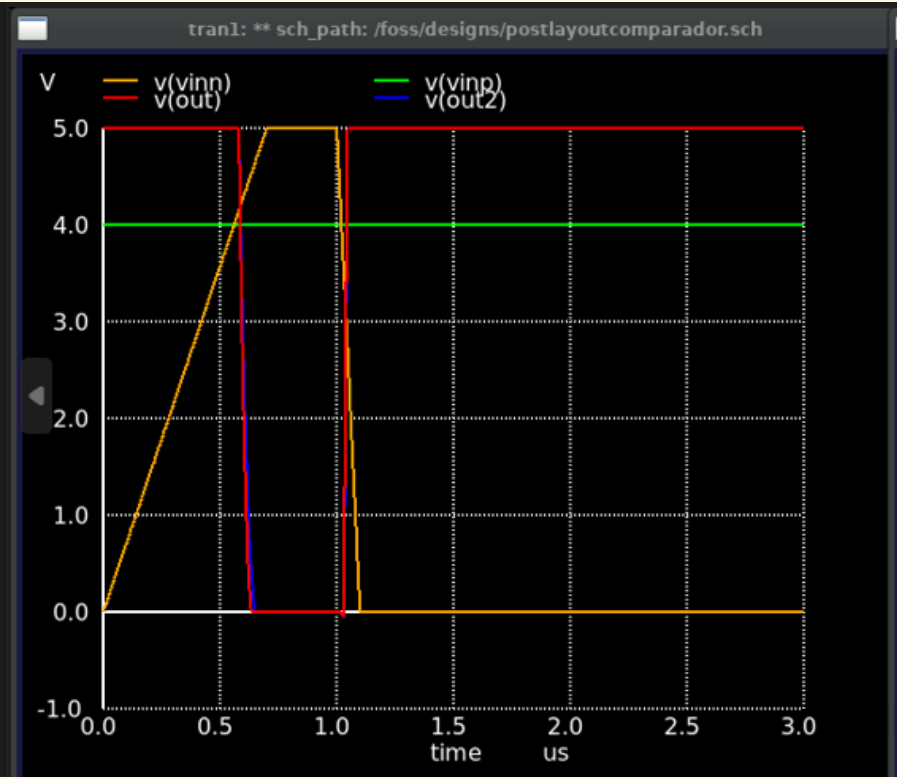
Simulación Post-Layout

Post Layout comparador





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v(out)
v(vinp)
v(out2)
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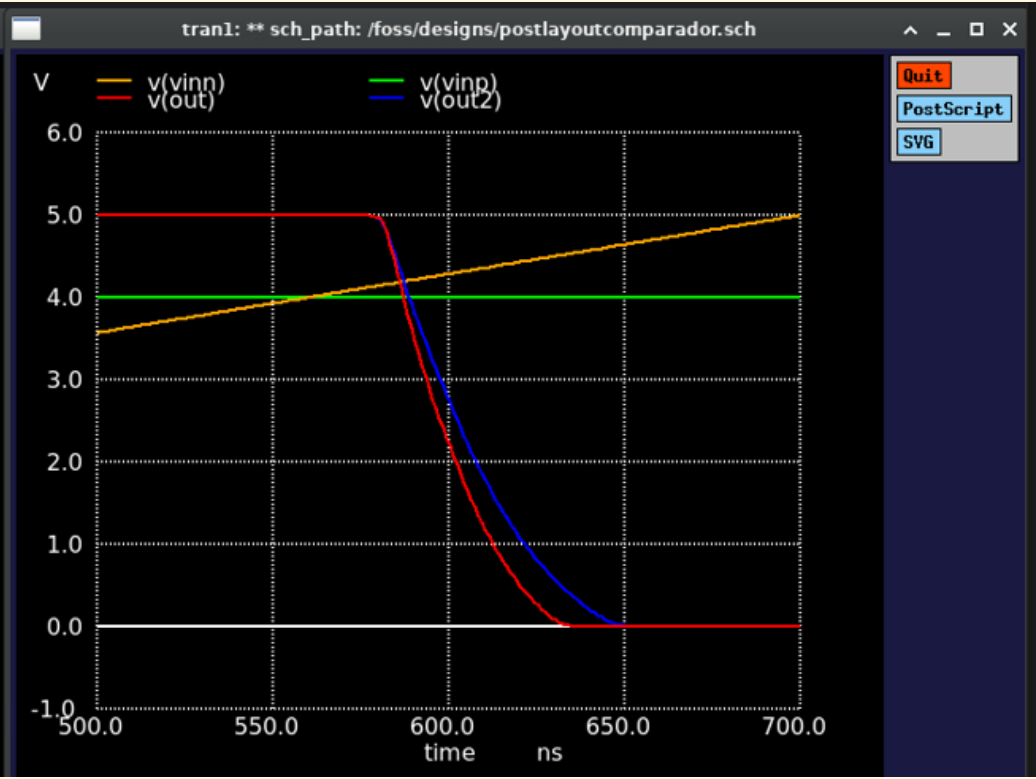
time
us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v(vinp)
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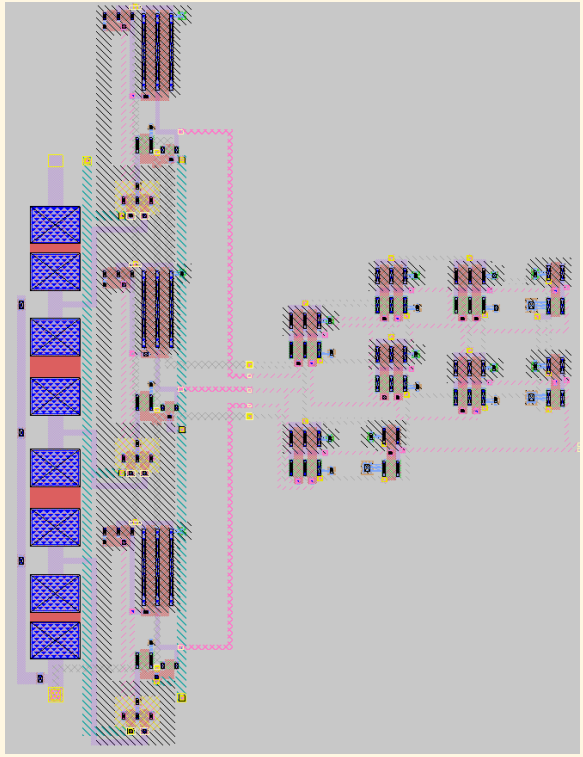
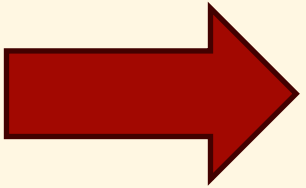
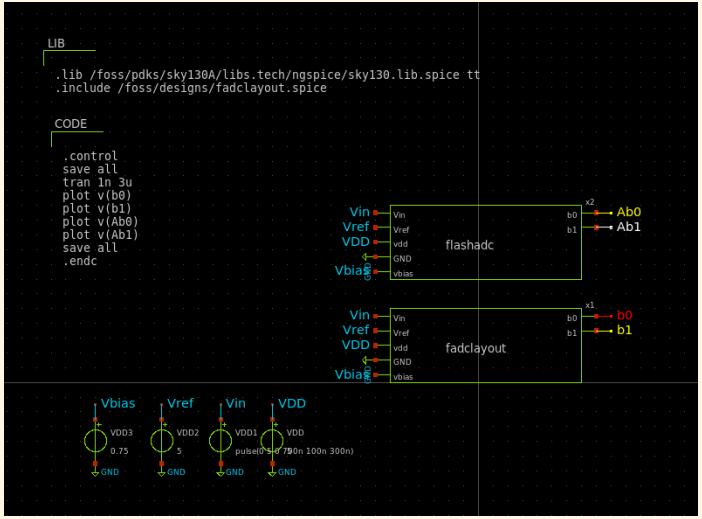
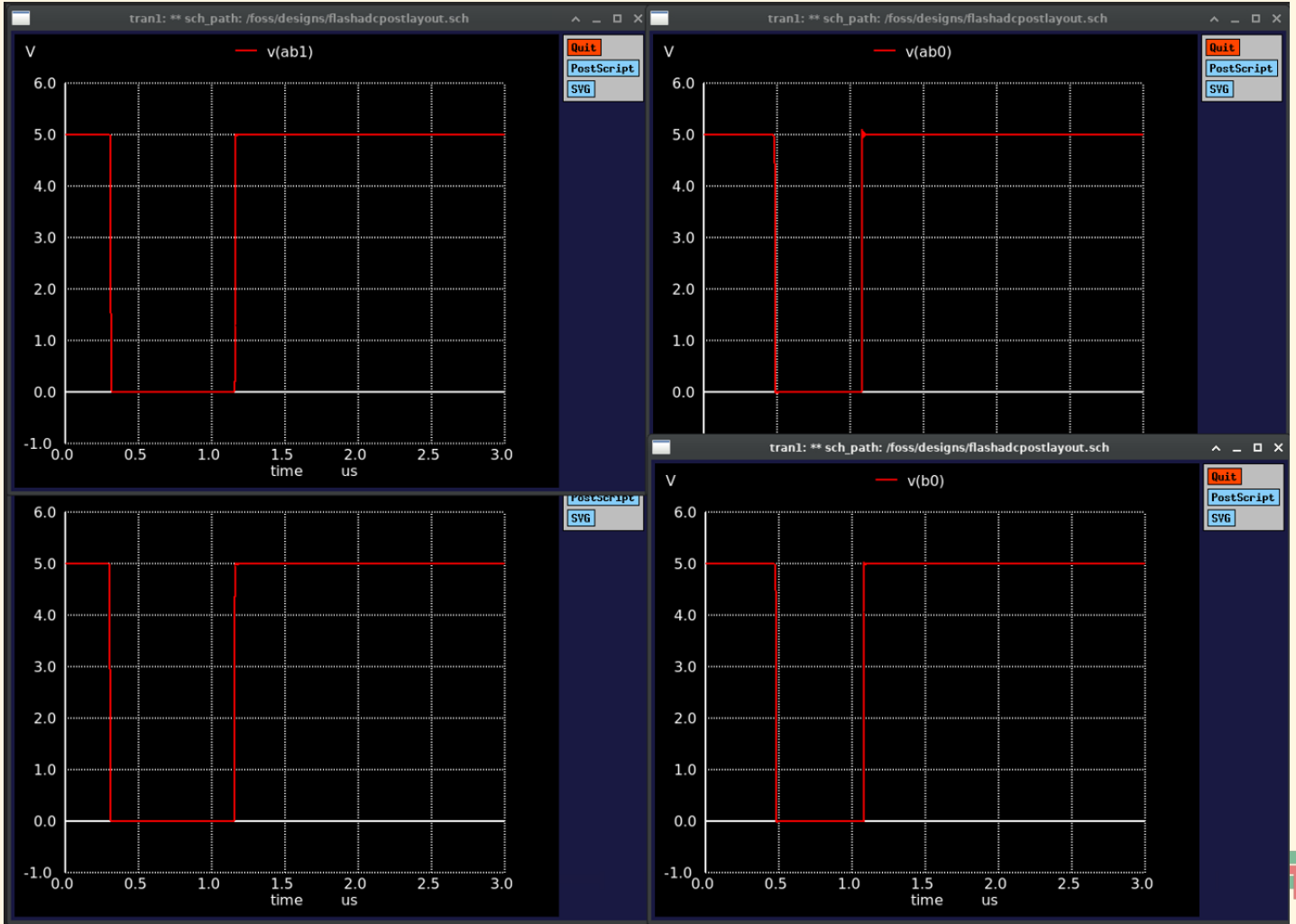
time
ns

Post Layout circuito completo





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2.0
2.5
3.0
time
us
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SVG
tran1: ** sch_path: /foss/designs/flashadcpostlayout.sch
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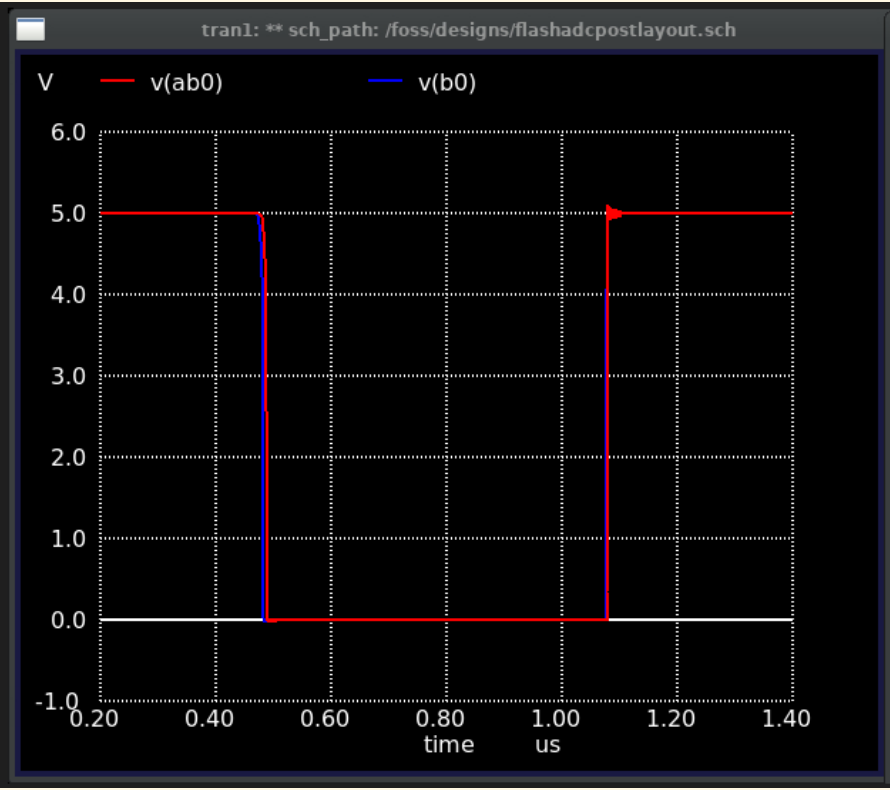
Quit
PostScript
SVG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v(b0)
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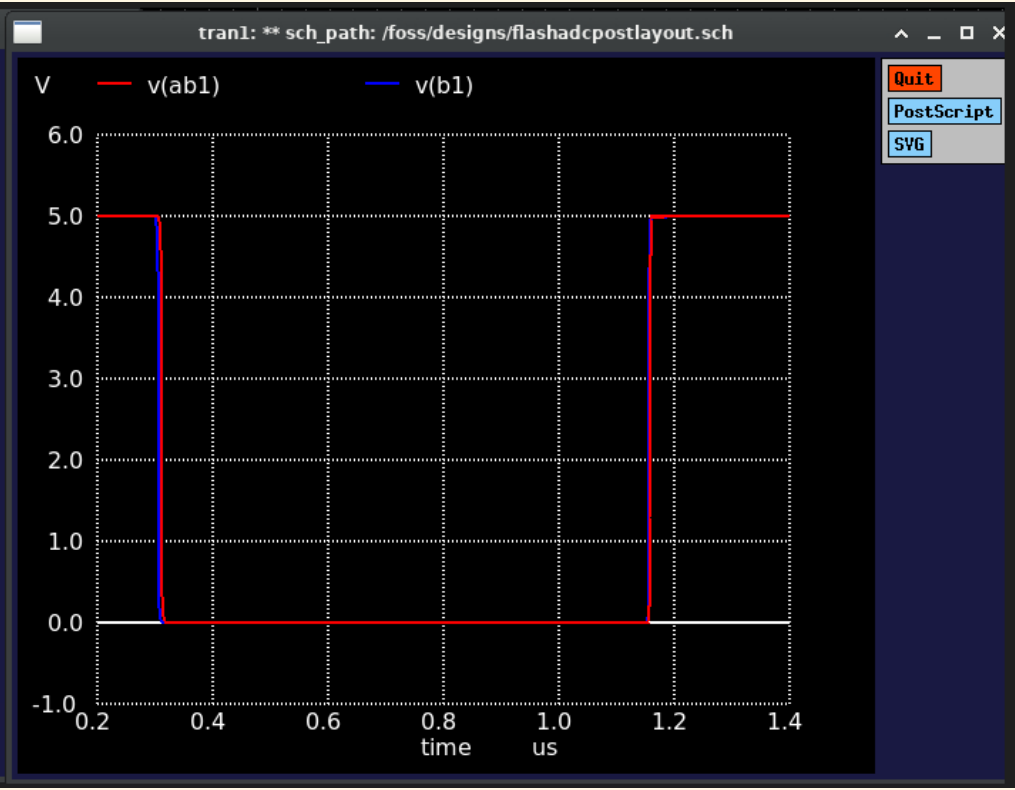
1.00
1.20
1.40
time
us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Quit
PostScript
SVG
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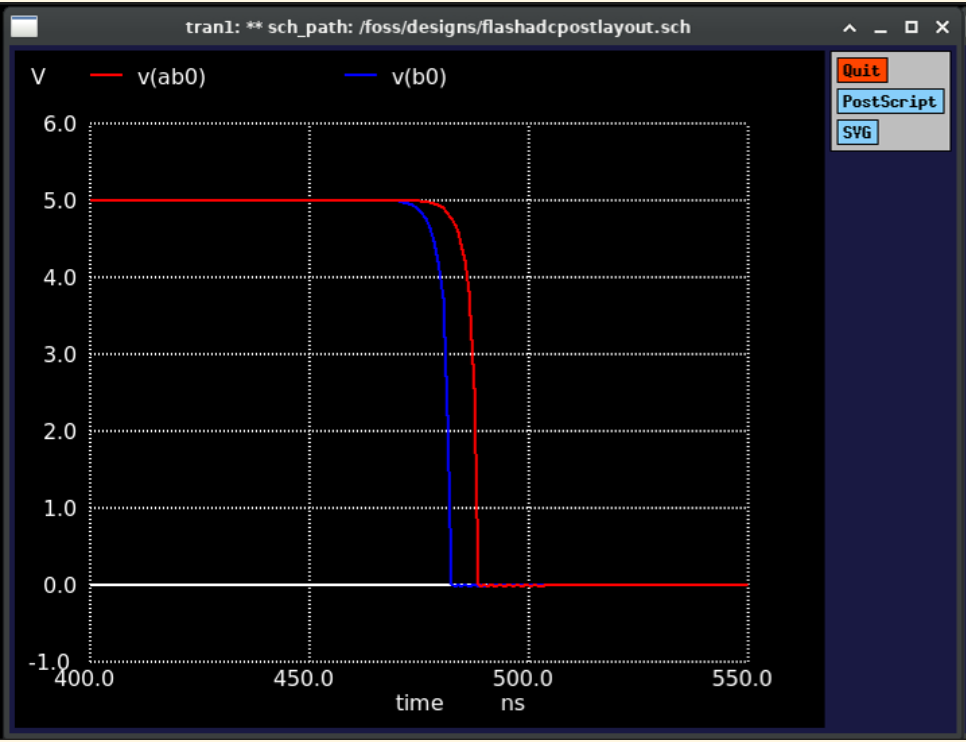
0.8
1.0
1.2
1.4
time
us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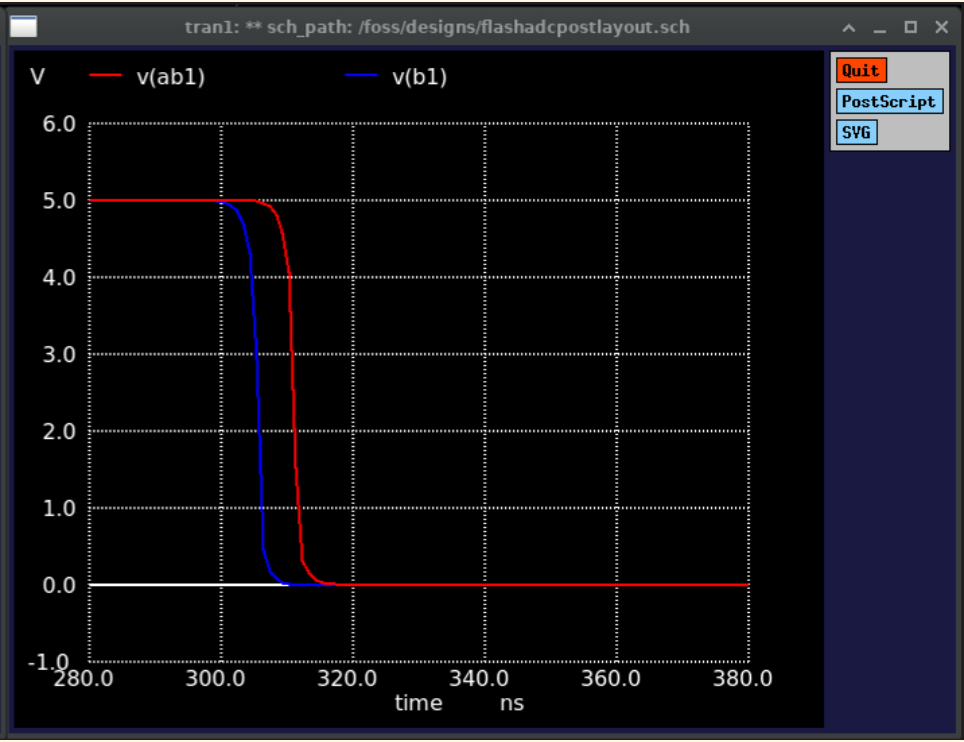
time
ns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v(ab1)
v(b1)
Quit
PostScript
SVG
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2.0
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280.0
300.0
320.0
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360.0
380.0
time
ns