

Felix_Chen_Lab4

Tags

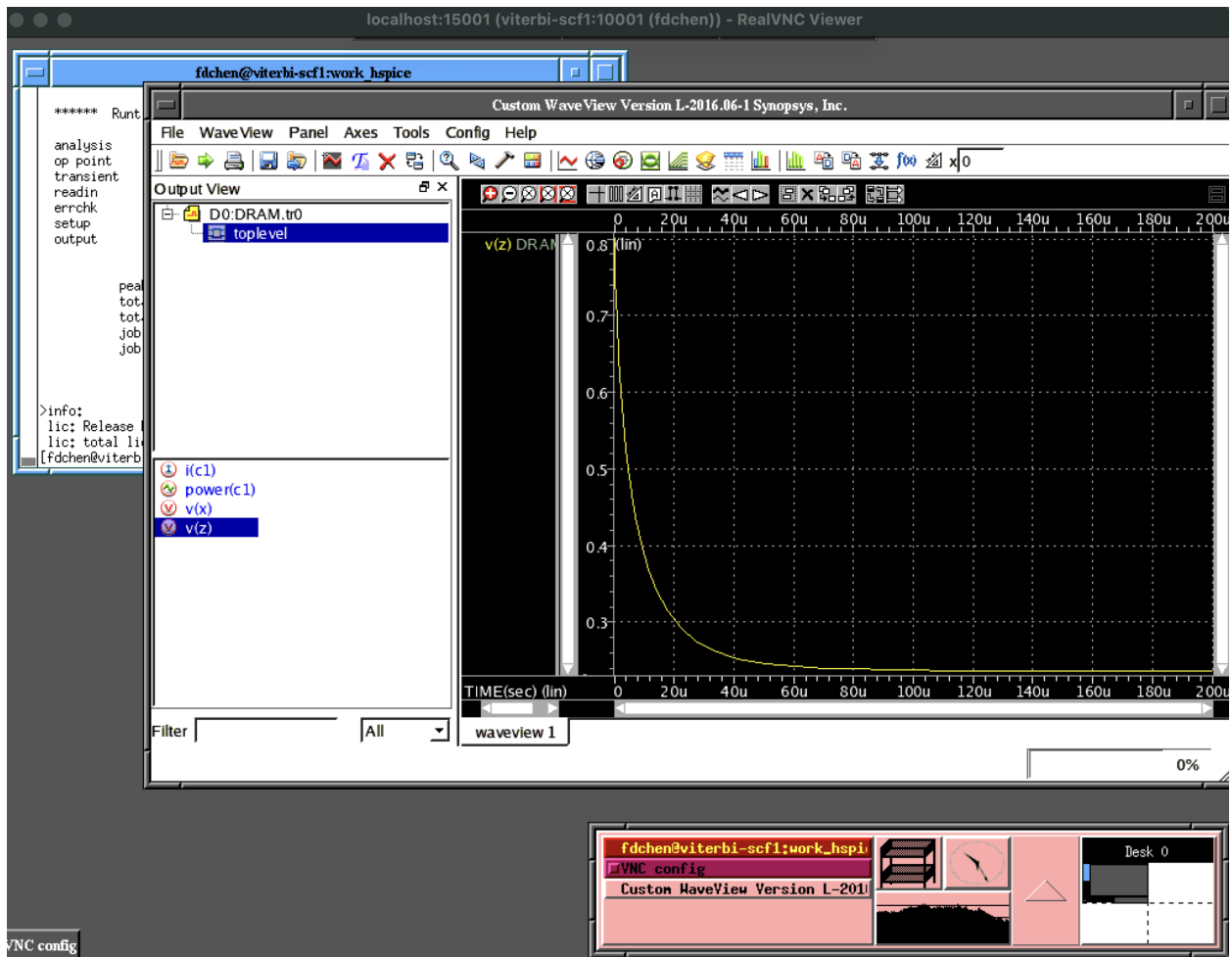
Part 1

DRAM

The hspice file

```
Lab4 > DRAM.sp
1  ** Simple DRAM using PTM 45 nm Node
2
3  .include CMOSP.inc
4  .include CMOSN.inc
5
6  .PARAM VDD = 0.8
7
8  ** Circuit Netlist
9
10 ** Supply and Input Sources
11 VSUP X 0 'VDD/2'
12 VG Y 0 0
13
14 ** Transistors
15 M1 Z Y X VDD CMOSN L=45n W=120n
16
17 ** Capacitor
18 C1 Z 0 C=10f
19
20 ** Initial condition
21 .IC V(Z) = 'VDD'
22
23 ** Analysis Setup
24 .TRAN 0.001u 800u
25
26 ** Control Information
27 .OPTION POST BRIEF NOMOD PROBE MEASOUT
28
29 ** Print and Measurement
30 .PRINT V(X) V(Z)
31 .MEASURE TRAN RTL TRIG AT=0 TARG V(Z) VAL=0.6 FALL=1
32 .MEASURE TRAN AVG_CUR AVG I(C1) FROM 0 to 'RTL'
33 .MEASURE TRAN AVG_PWR AVG P(C1) FROM 0 to 'RTL'
34
35 .END
```

C=0.1fF

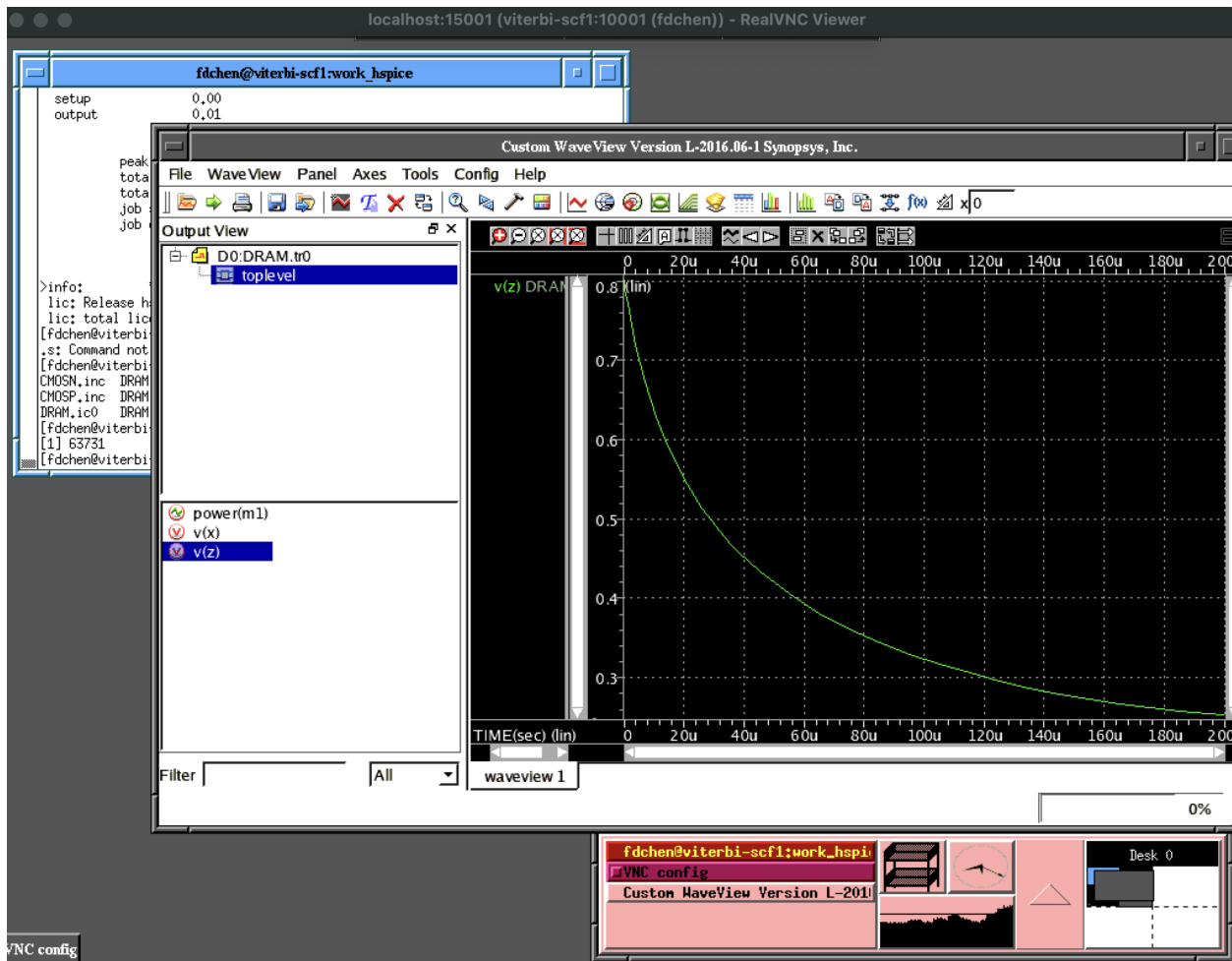


$$RTL = 2.151e^{-6}$$

$$\text{average power} = -6.546e^{-12}$$

$$\text{average current} = -9.342e^{-12}$$

$$C=1fF$$

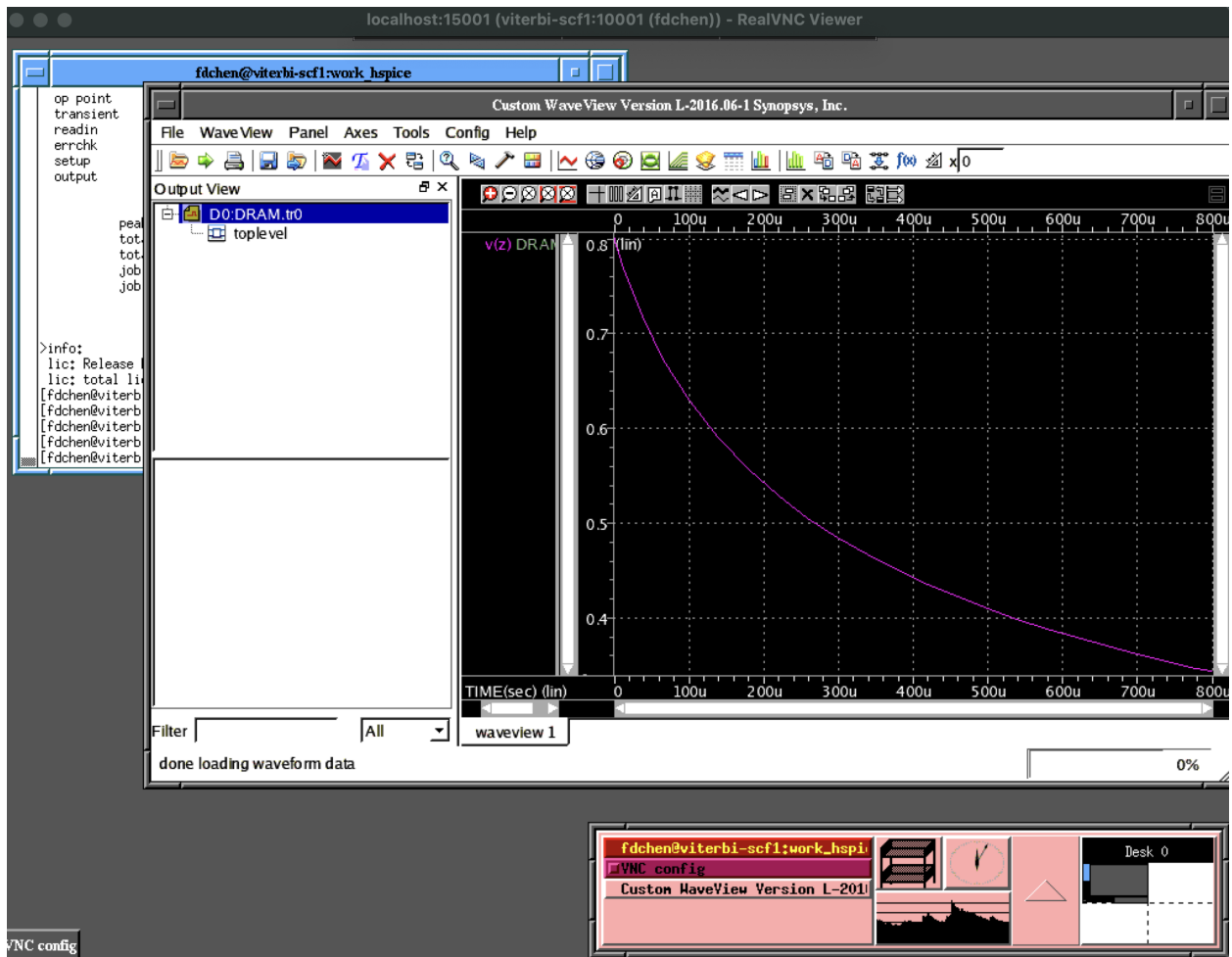


$$RTL = 1.370e^{-5}$$

$$\text{average power} = -1.024e^{-11}$$

$$\text{average current} = -1.457e^{-11}$$

$$C=10fF$$



$$RTL = 1.29e^{-4}$$

$$\text{average power} = -1.093e^{-11}$$

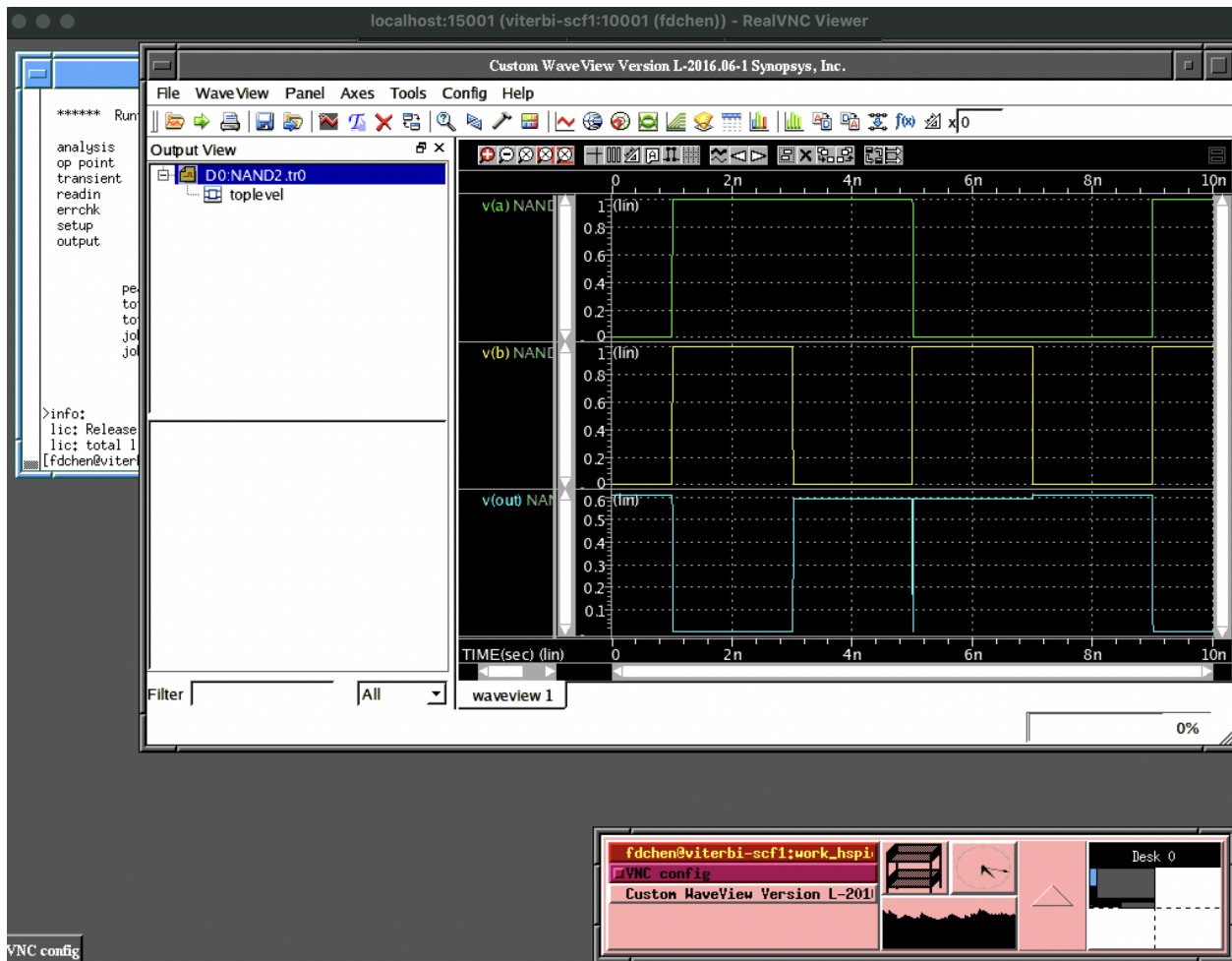
$$\text{average current} = -1.557e^{-11}$$

Observation

The higher the capacitance of the capacitor is, the longer it takes to discharge. This makes sense because capacitors with the most capacitance holds the most charge for the same voltage.

NAND2

Waveform



File

```
CMOSN.inc  DRAM.sp  NAND2.sp x  inverter.sp  RC.sp

Lab4 > NAND2.sp
1  ** Simple DRAM using PTM 45 nm Node
2
3  .include CMOSP.inc
4  .include CMOSN.inc
5
6  ** Circuit Netlist
7
8  ** Supply and Input Sources
9  V_SUP VDD 0 1
10 VPIN_A A 0 PULSE 0 1.0 1ns 10ps 10ps 4ns 8ns
11 VPIN_B B 0 PULSE 0 1.0 1ns 10ps 10ps 2ns 4ns
12
13 ** Transistors
14 M_PU_A OUT A VDD CMOSP L=45n W=180n
15 M_PU_B OUT B VDD CMOSP L=45n W=180n
16
17 M_PD_A OUT A X CMOSN L=45n W=240n
18 M_PD_B X B 0 CMOSN L=45n W=240n
19
20 ** Initial condition
21 .IC V(X) = 0
22
23 ** Analysis Setup
24 .TRAN 0.1ns 10n
25
26 ** Control Information
27 .OPTION POST BRIEF NOMOD PROBE MEASOUT
28
29 ** Print and Measurement
30 .PRINT V(A) V(B) V(OUT)
31
32 .END
```