

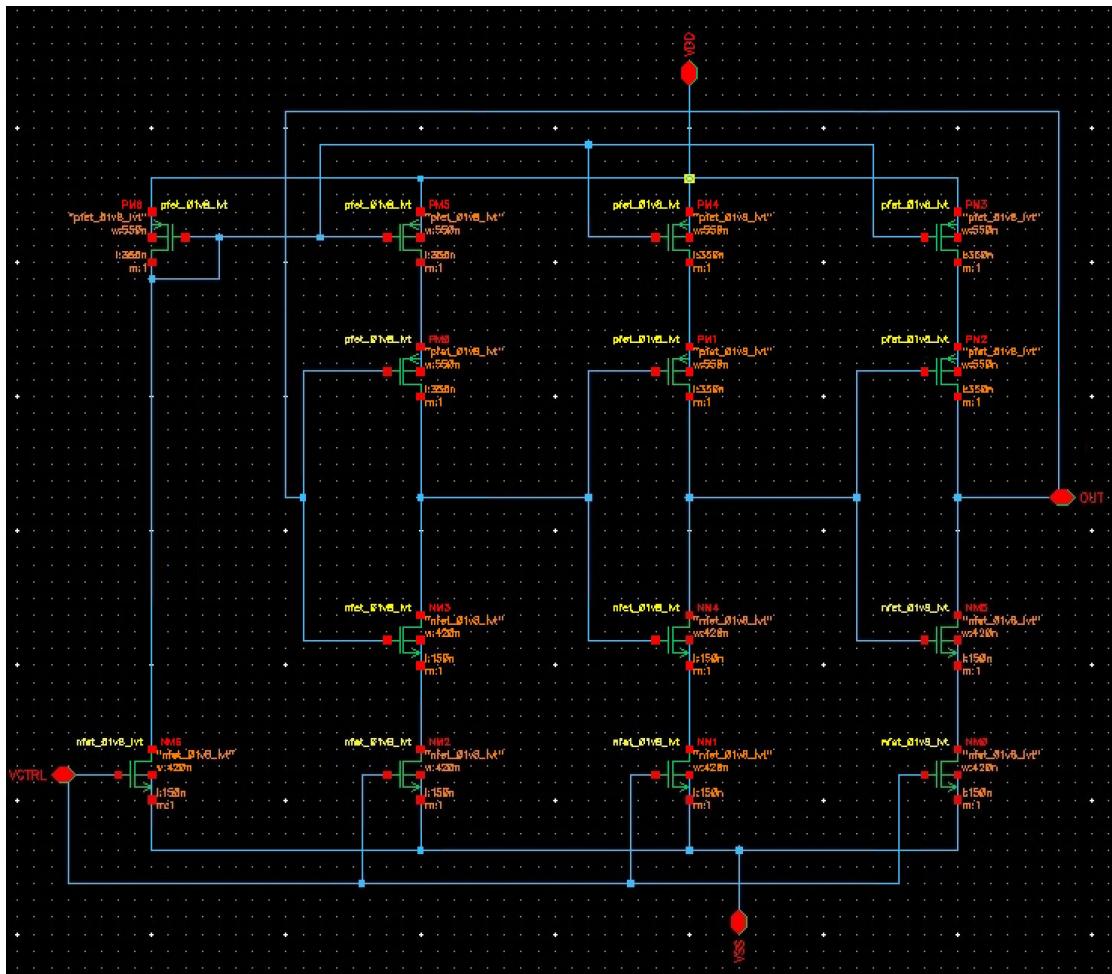
# AMS Onboarding Design Review

Nayan Ramam

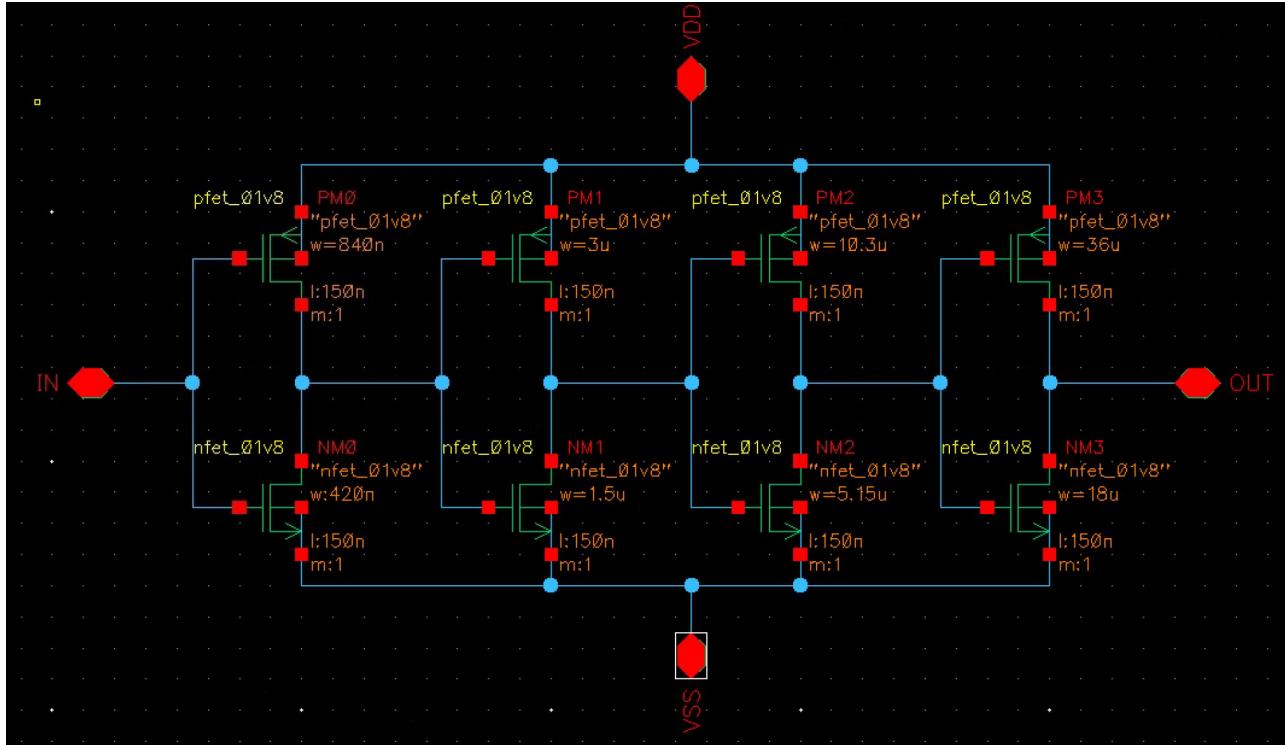
# Design Analysis

- Chose current starved inverter based design to avoid using caps and because it was recommended by Pranav
- For RO sizing, I started with the default values for the transistors
- For the buffer, I found the current for the final stage with  $I = C_L V_{DD} f = 0.9 \text{ mA}$  @ 1 pF, 1.8 V, and 500 MHz
  - Multiply by 4 to get edge current. Width =  $I_{edge} / \text{approx of } I_{dsat} \text{ per um} \rightarrow 3.6/0.2 = 18\mu$  for nmos and  $36\mu$  for pmos.
  - Picked first stage sizes by minimum width of 420n for nmos, 2:1 ratio for pmos to nmos.
  - Calculated width to have constant factor between each stage then rounded to make fab possible

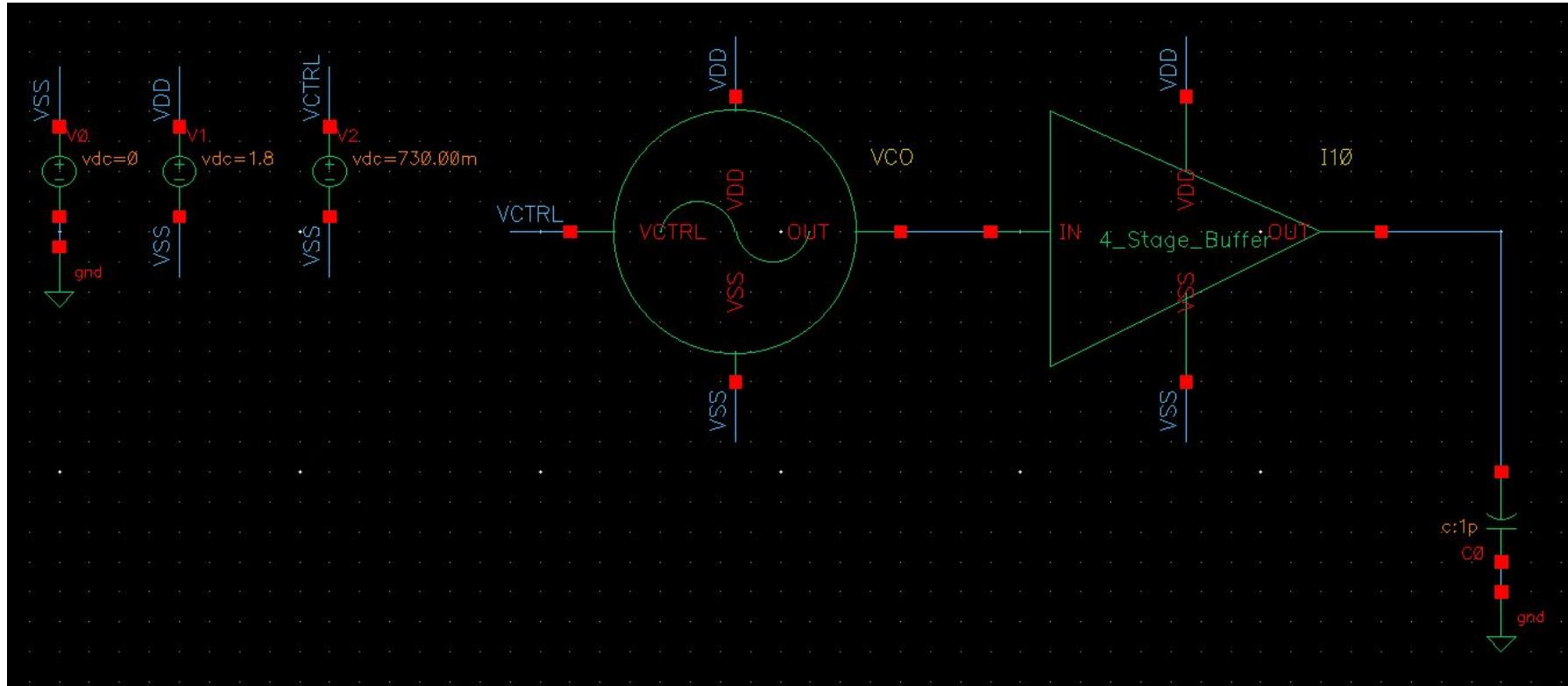
# Design Schematics - Oscillator



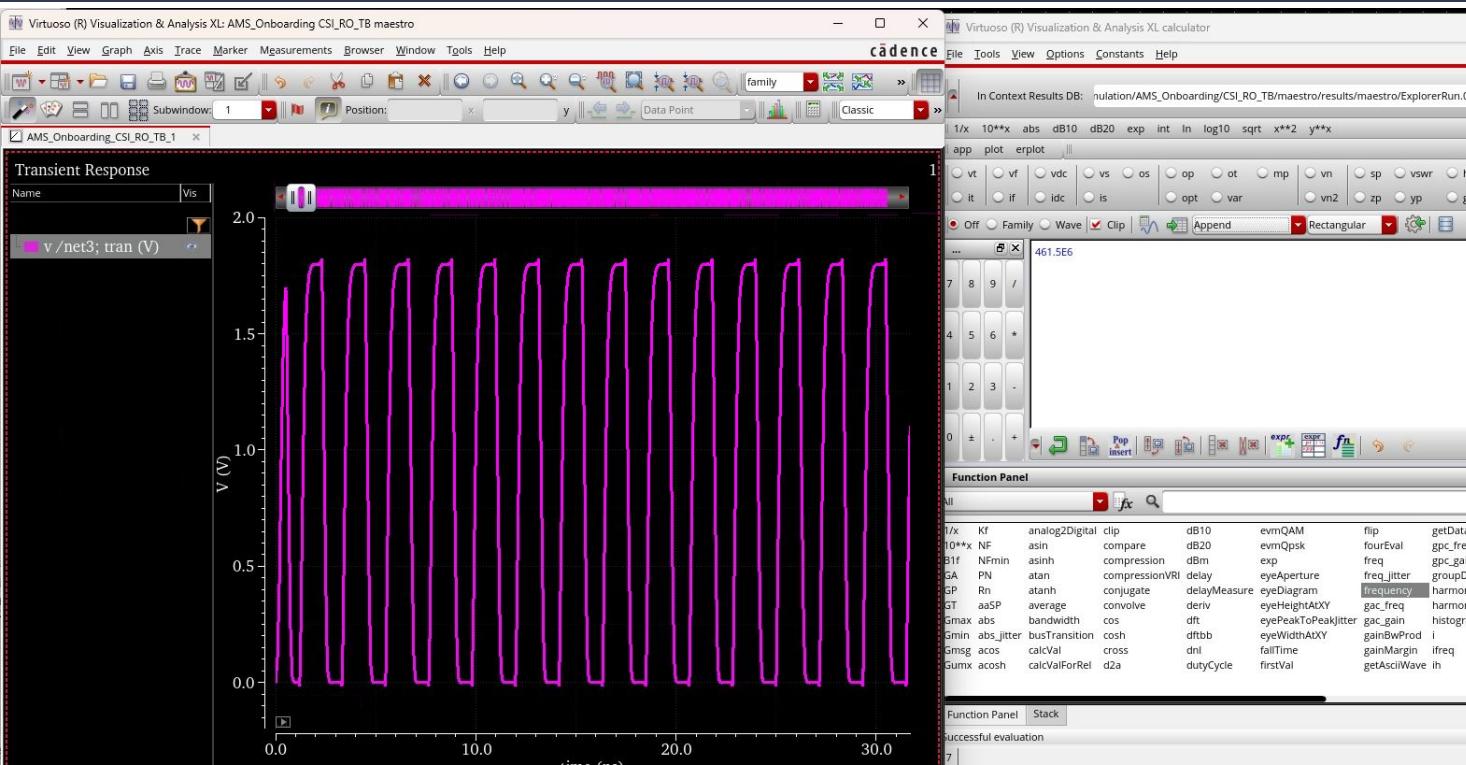
# Design Schematics - Buffer



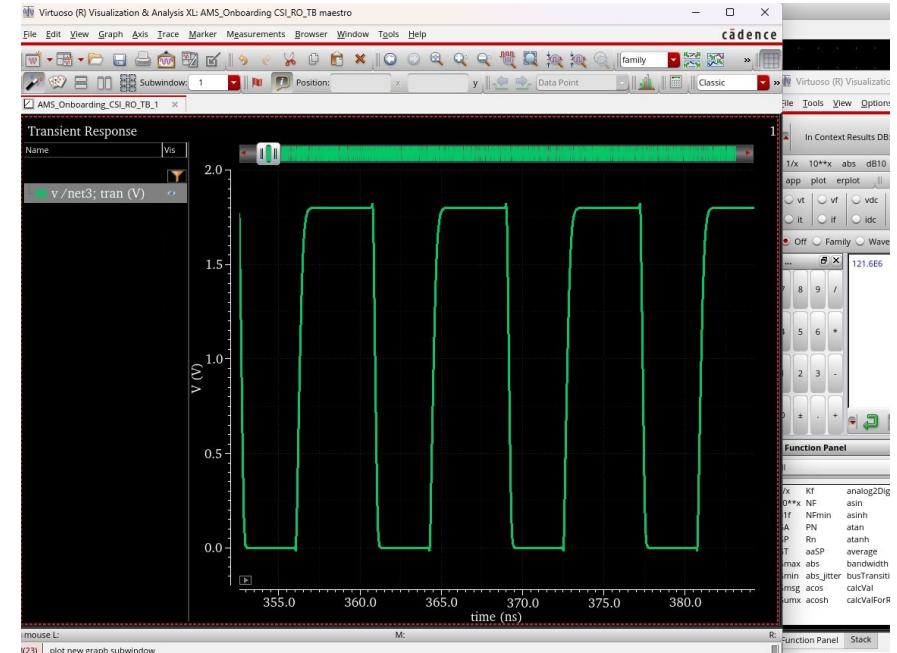
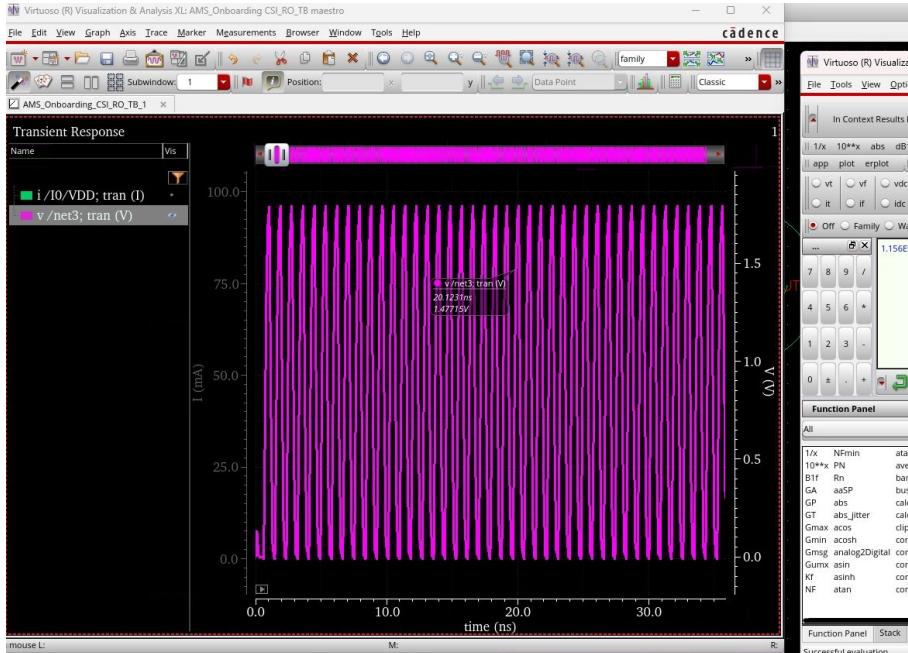
# Design Schematics - Testbench



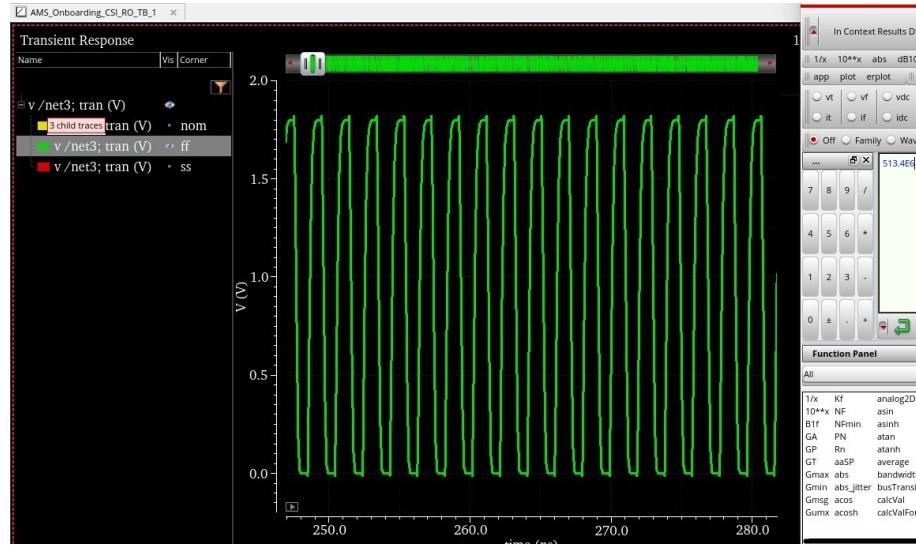
# Oscillation at 27 C



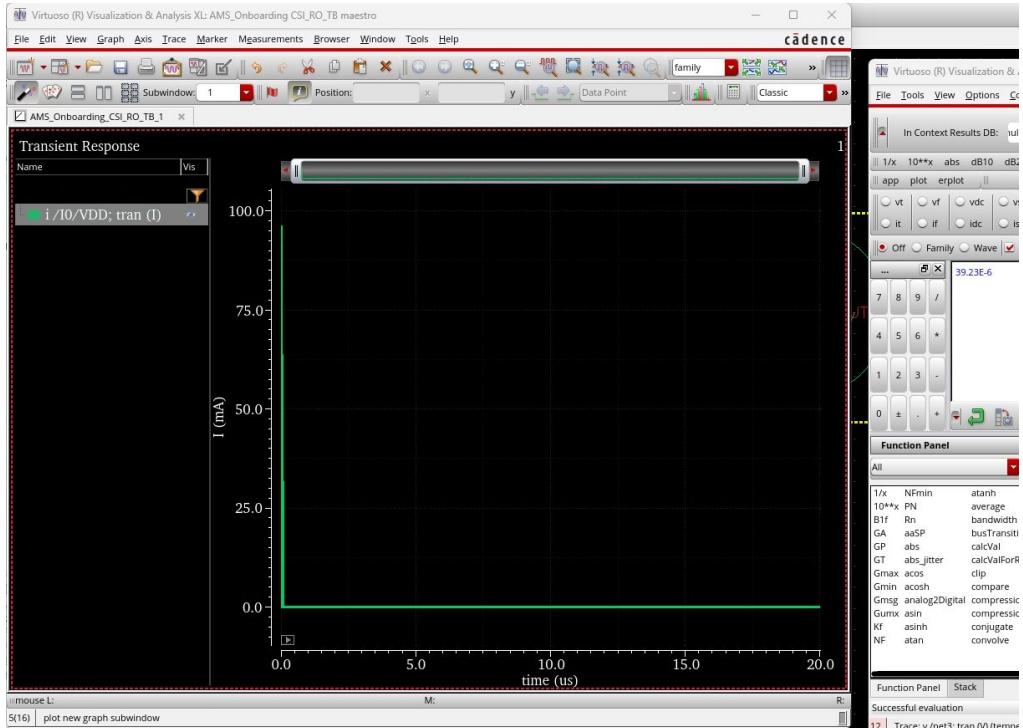
# ff and ss corners



# Freq at 70 C and 0 C

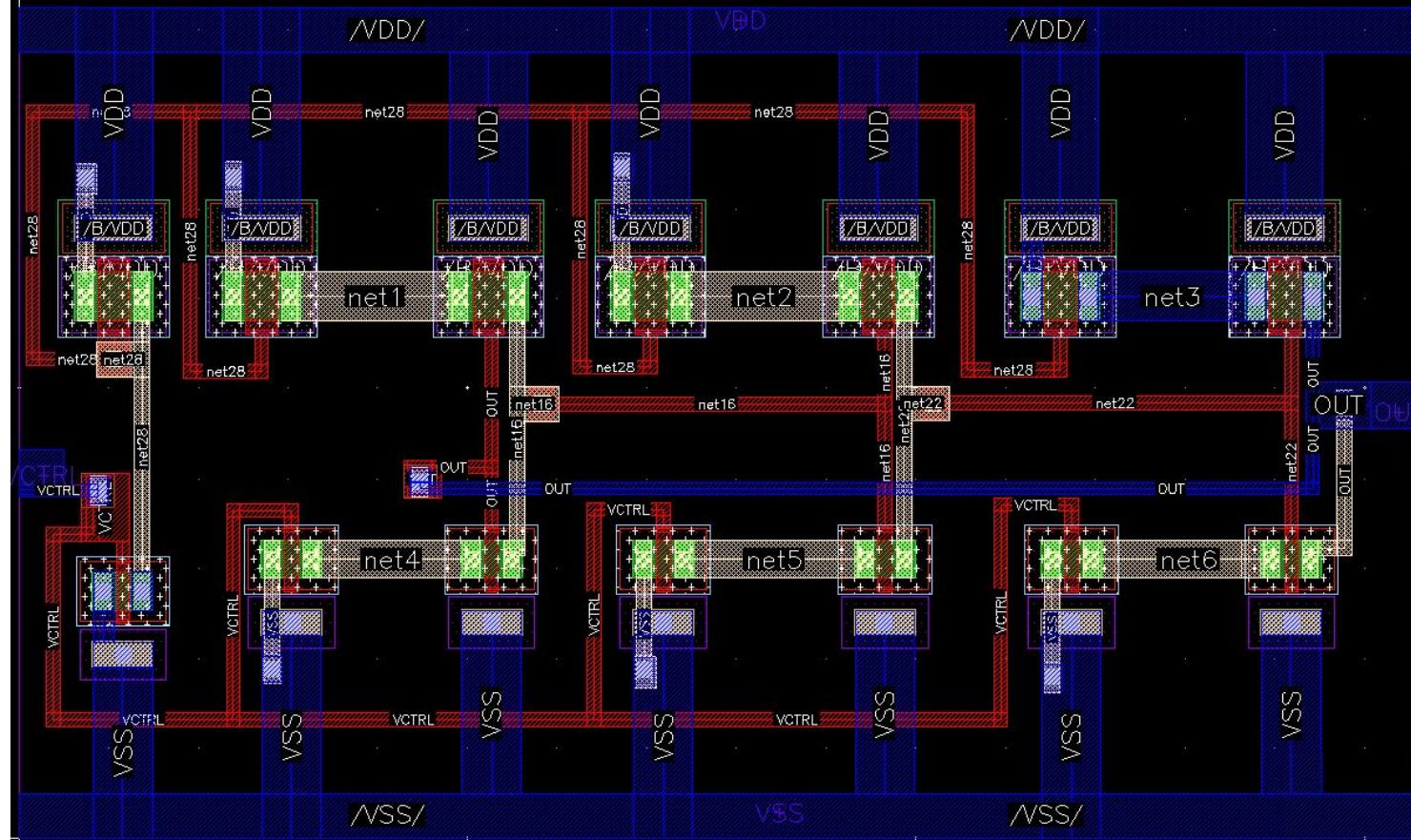


# Average Power Draw



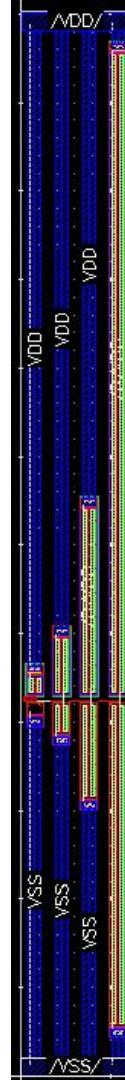
- Multiplied average current by 1.8 V

Result:  $39.23 \mu\text{A}$



Layout - Oscillator

# Layout - Buffer



# Passed DRC for Oscillator Block

```
X Pegasus 24.14-64b Reports: Done [DRC] Virtuoso...
[DRC] Virtuoso X

INFO: Rule psd.8 completed with no violations, 421/428, remaining rules: nwell.2a.lv nwell.4 poly.12 psd.9 x.1b x.2.licon x.2.mcon
INFO: Rule psd.9 completed with no violations, 422/428, remaining rules: nwell.2a.lv nwell.4 poly.12 x.1b x.2.licon x.2.mcon
INFO: Rule nwell.4 completed with no violations, 423/428, remaining rules: nwell.2a.lv poly.12 x.1b x.2.licon x.2.mcon
INFO: Rule poly.12 completed with no violations, 424/428, remaining rules: nwell.2a.lv x.1b x.2.licon x.2.mcon
INFO: Rule x.1b completed with no violations, 425/428, remaining rules: nwell.2a.lv x.2.licon x.2.mcon
INFO: Rule x.2.licon completed with no violations, 426/428, remaining rules: nwell.2a.lv x.2.mcon
INFO: Rule x.2.mcon completed with no violations, 427/428, remaining rules: nwell.2a.lv
INFO: Rule nwell.2a.lv completed with no violations, 428/428
INFO: Status: Runset Finished as of 2025-11-28 17:18:33    Elapsed: 00:00:14    CPU time[s]: 7
INFO: Resource usage by worker at exit:
      CPU     Elapsed   Threads   CPU      Peak Total   Peak Active
Worker: time[s]  time[s]  Allocated  usage[%]  Memory[MB]  Memory[MB]
       1:        7       11        4      15.91      687         32
Worker resource usage summary: Total CPU[s]: 7  Run duration[s]: 11  Max peak memory[MB]: 687
Worker CPU utilization summary: 7 of 44 available CPU seconds (15.91%) with 4 average available CPUs
INFO: Generating summary in /nethome/nramam3/AMS-Onboarding/Cadence/Virtuoso/CSI_RO.sum
INFO: All selected rules completed
Total CPU Time          : 7(s)
Total Real Time         : 11(s)
Total Original Geometry: 226 (356)
Total DRC RuleChecks   : 428
Total DRC Results       : 0 (0)
ASCII report database is /nethome/nramam3/AMS-Onboarding/Cadence/Virtuoso/CSI_RO.drc_errors.ascii
INFO: Checking in all SoftShare licenses.

Pegasus finished normally. 2025-11-28 17:18:33
```

# Passed DRC for Buffer

X Pegasus 24.14-64b Reports: Done [DRC] Virtuos...

[DRC] Virtuoso X

```
INFO: Generating summary in /nethome/nramam3/AMS-Onboarding/Cadence
INFO: All selected rules completed
      Total CPU Time : 6 (s)
      Total Real Time : 13 (s)
      Total Original Geometry : 636 (666)
      Total DRC RuleChecks : 428
      Total DRC Results : 0 (0)
      ASCII report database is /nethome/nramam3/AMS-Onboarding/Cade
INFO: Checking in all SoftShare licenses.
```

Find  ▾ Prev Next  Match case  Whole word  Use RegExp  Highlight

Issues List ▾

# Passed LVS for Oscillator Block

```
INFO: ##########
#           #
# Extraction Run Summary : Clean      #
# Extraction Report File : CSI_RO.rep #
# ERC Results            : Empty       #
# ERC Summary File       : CSI_RO.sum #
#
#####
Total CPU Time          : 12(s)
Total Real Time         : 28(s)
Total Original Geometry : 203 (452)
Total ERC RuleChecks    : 0
Total ERC Results       : 0 (0)
INFO: Pegasus REPORTDB creation started...
INFO: Processing file /nethome/nramam3/AMS-Onboarding/Cadence/Virtuoso/CSI_RO.rep
INFO: Manager summary: CPU(s): 0 Elapsed(s): 1 Peak memory(MB): 0.00
INFO: Pegasus REPORTDB creation completed. 2026-01-22 21:23:25
INFO: Checking in all SoftShare licenses.
```

Pegasus finished normally. 2026-01-22 21:23:26

# Passed LVS for Buffer

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```
INFO: ######
#                                     #
# Extraction Run Summary : Clean      #
# Extraction Report File : 4_Stage_Buffer.rep #
# ERC Results           : Empty        #
# ERC Summary File     : 4_Stage_Buffer.sum #
#                                     #
######
Total CPU Time          : 12(s)
Total Real Time         : 28(s)
Total Original Geometry : 635 (665)
Total ERC RuleChecks    : 0
Total ERC Results       : 0 (0)
INFO: Pegasus REPORTDB creation started...
INFO: Processing file /nethome/nramam3/AMS-Onboarding/Cadence/Virtuoso/4_Stage_Buffer.rep
INFO: Manager summary: CPU(s): 0 Elapsed(s): 0 Peak memory(MB): 0.00
INFO: Pegasus REPORTDB creation completed. 2026-01-22 21:45:08
INFO: Checking in all SoftShare licenses.
```

Pegasus finished normally. 2026-01-22 21:45:10