

AMS Onboarding Design Review

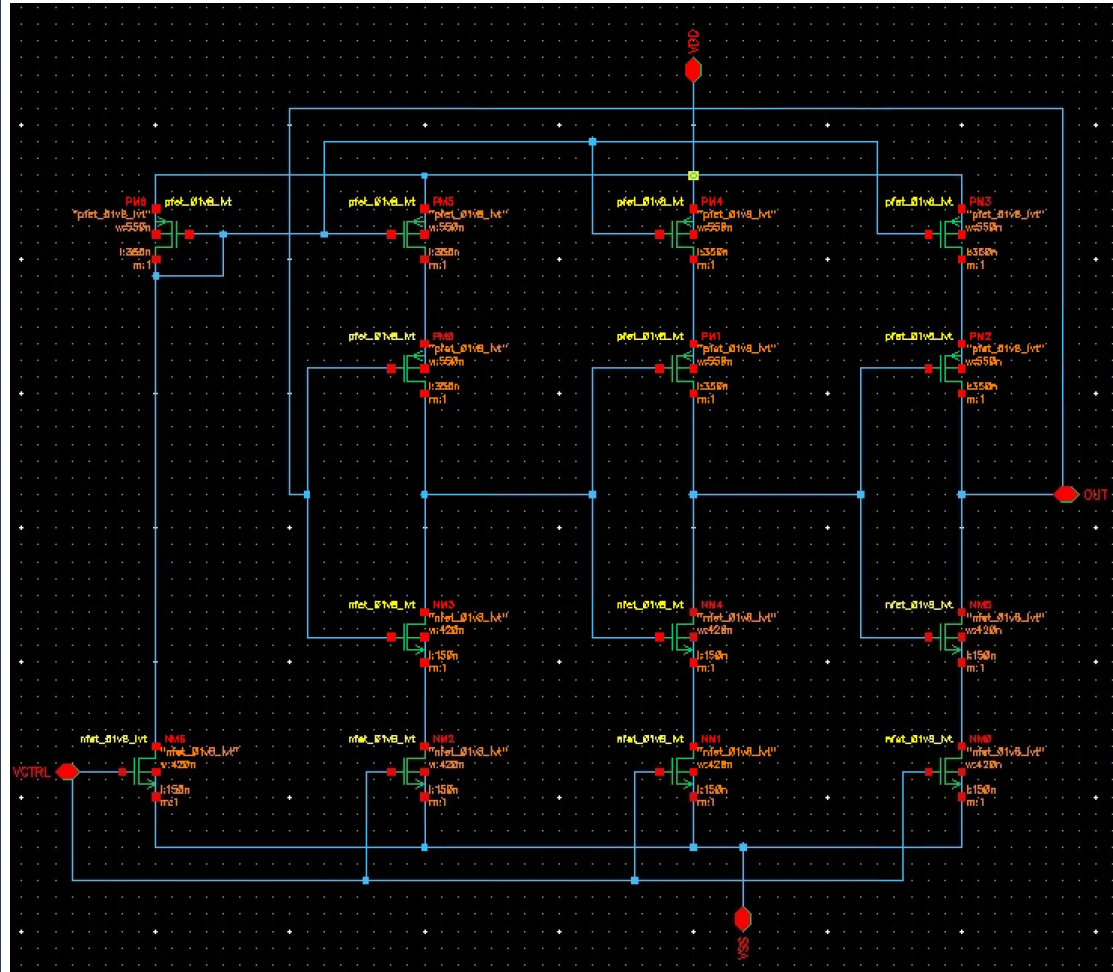
Nayan Ramam

A dark blue diagonal gradient bar that starts from the bottom left corner and extends towards the top right corner, covering the lower half of the slide.

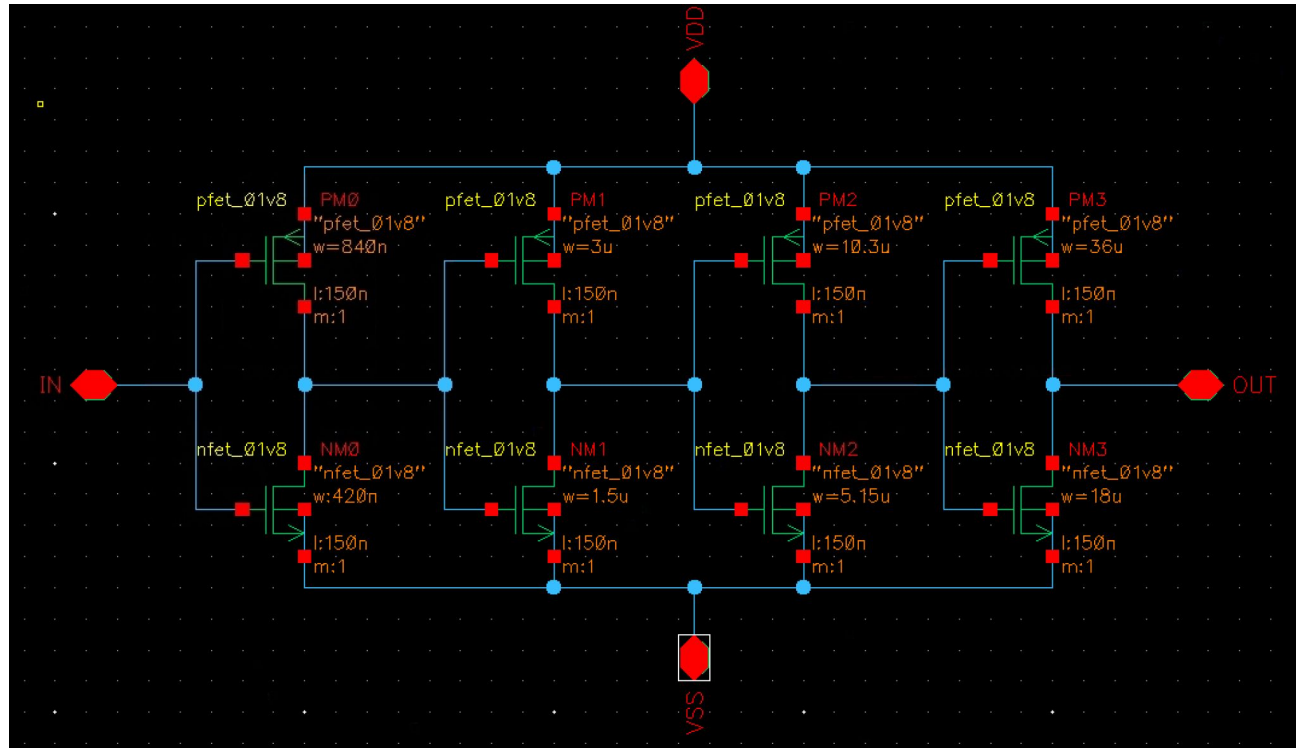
Design Analysis

- 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 = $I_{\text{edge}} / \text{approx of } I_{\text{dsat per um}} \rightarrow 3.6/0.2 = 18\text{u}$ for nmos and 36u 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

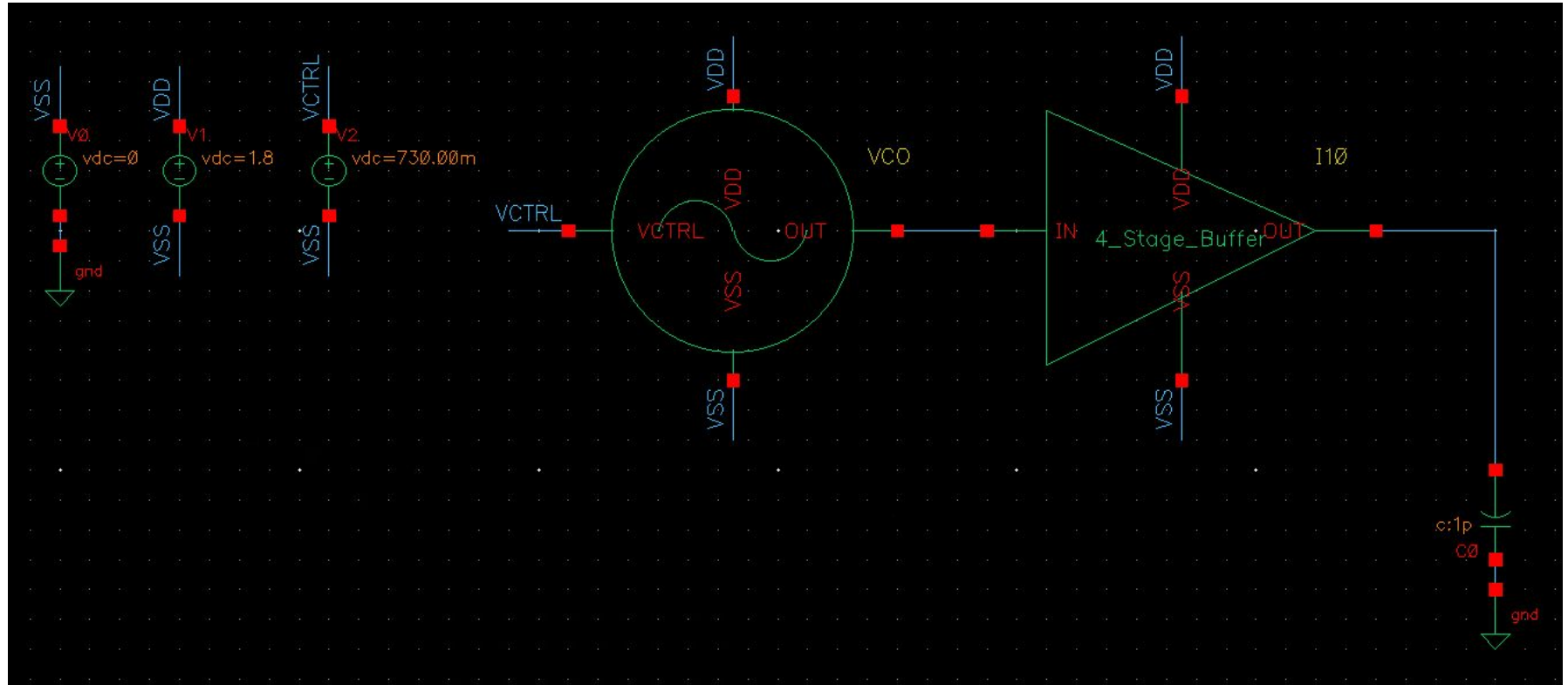
Design Schematics – Oscillator



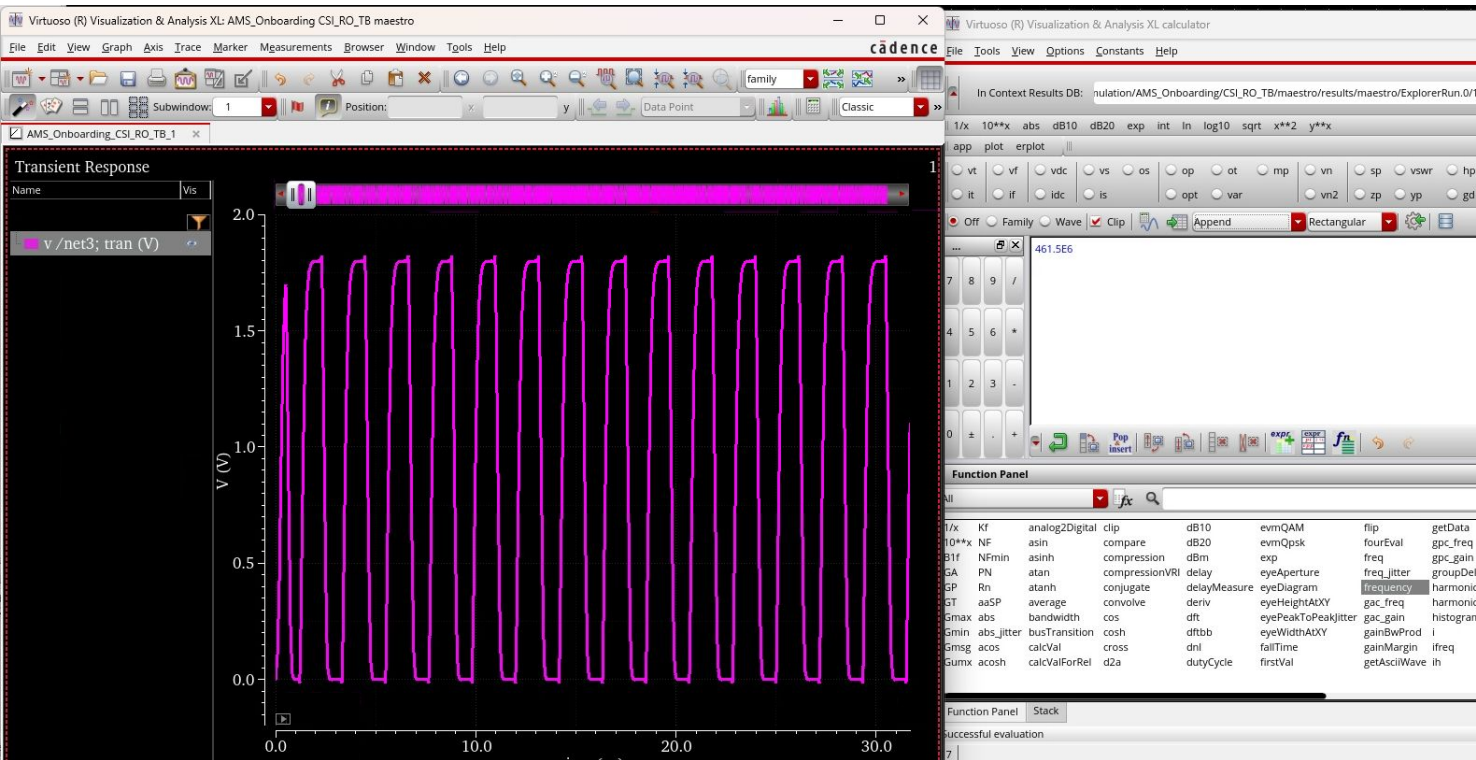
Design Schematics – Buffer



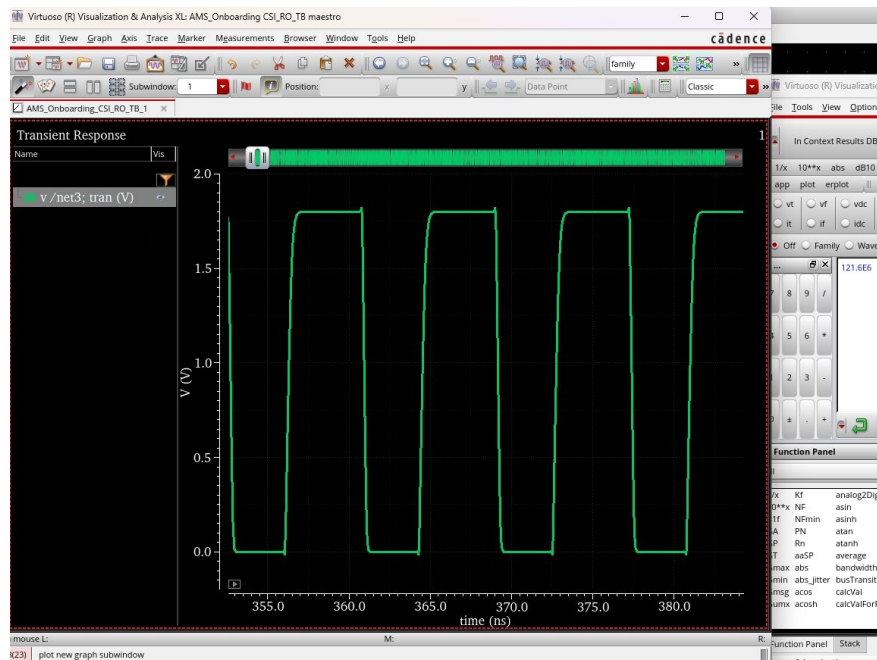
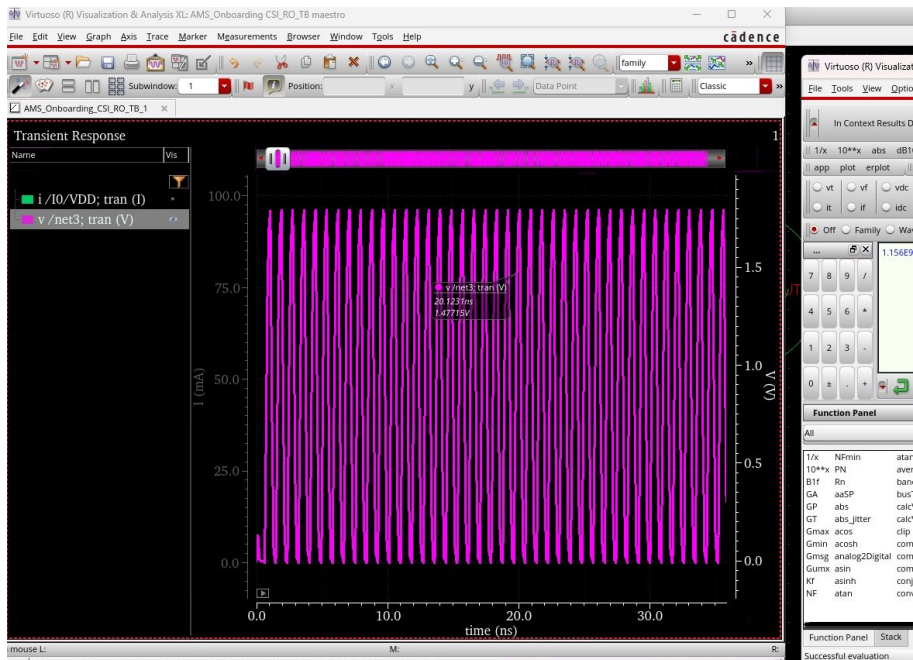
Design Schematics – Testbench



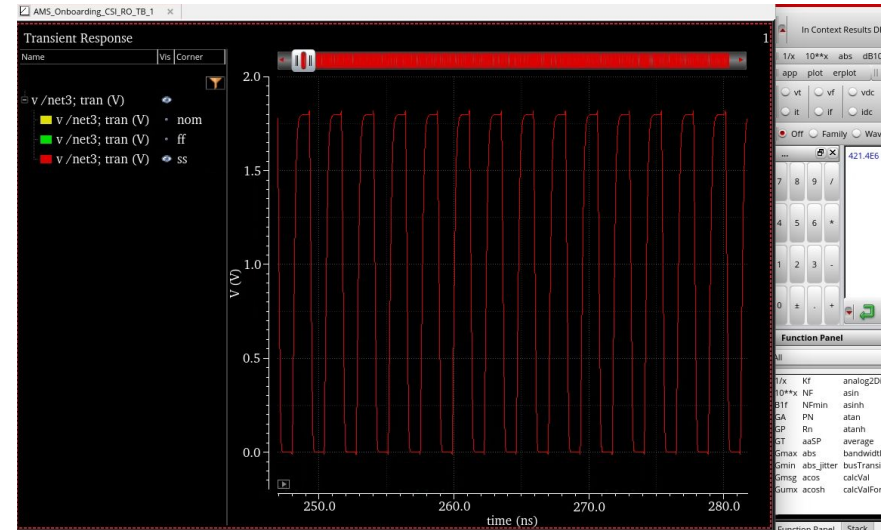
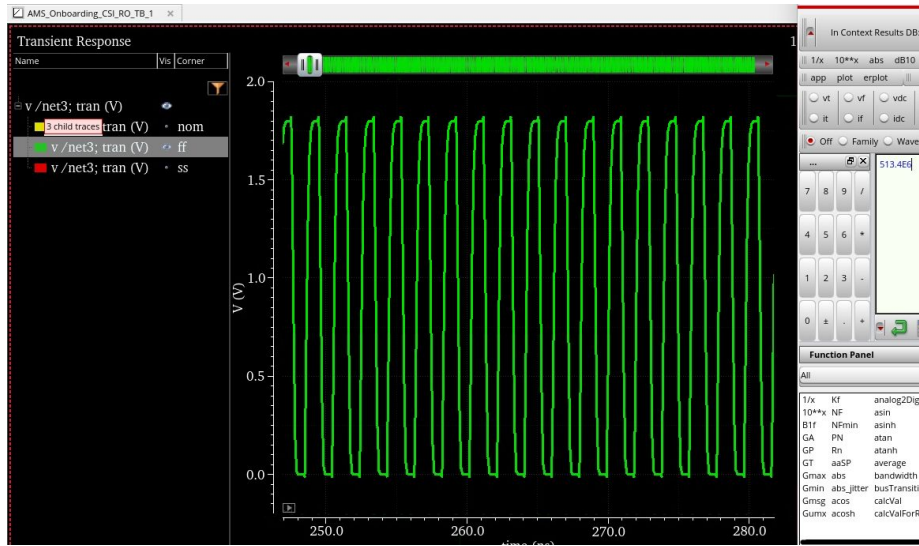
Oscillation at 27 C



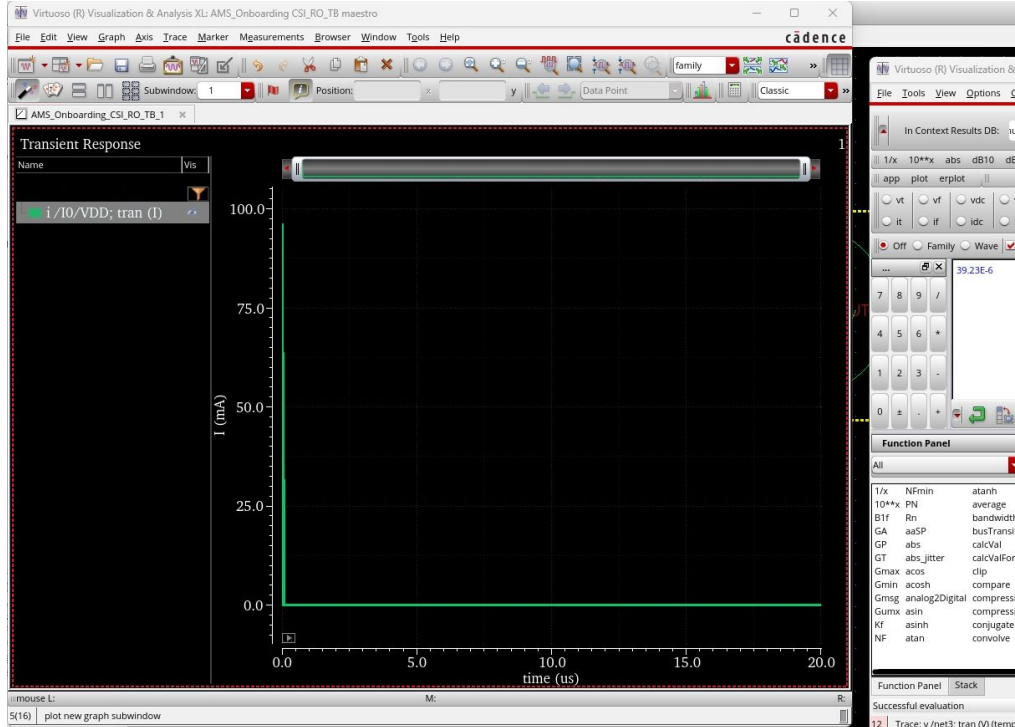
ff and ss corners



Freq at 70 C and 0 C

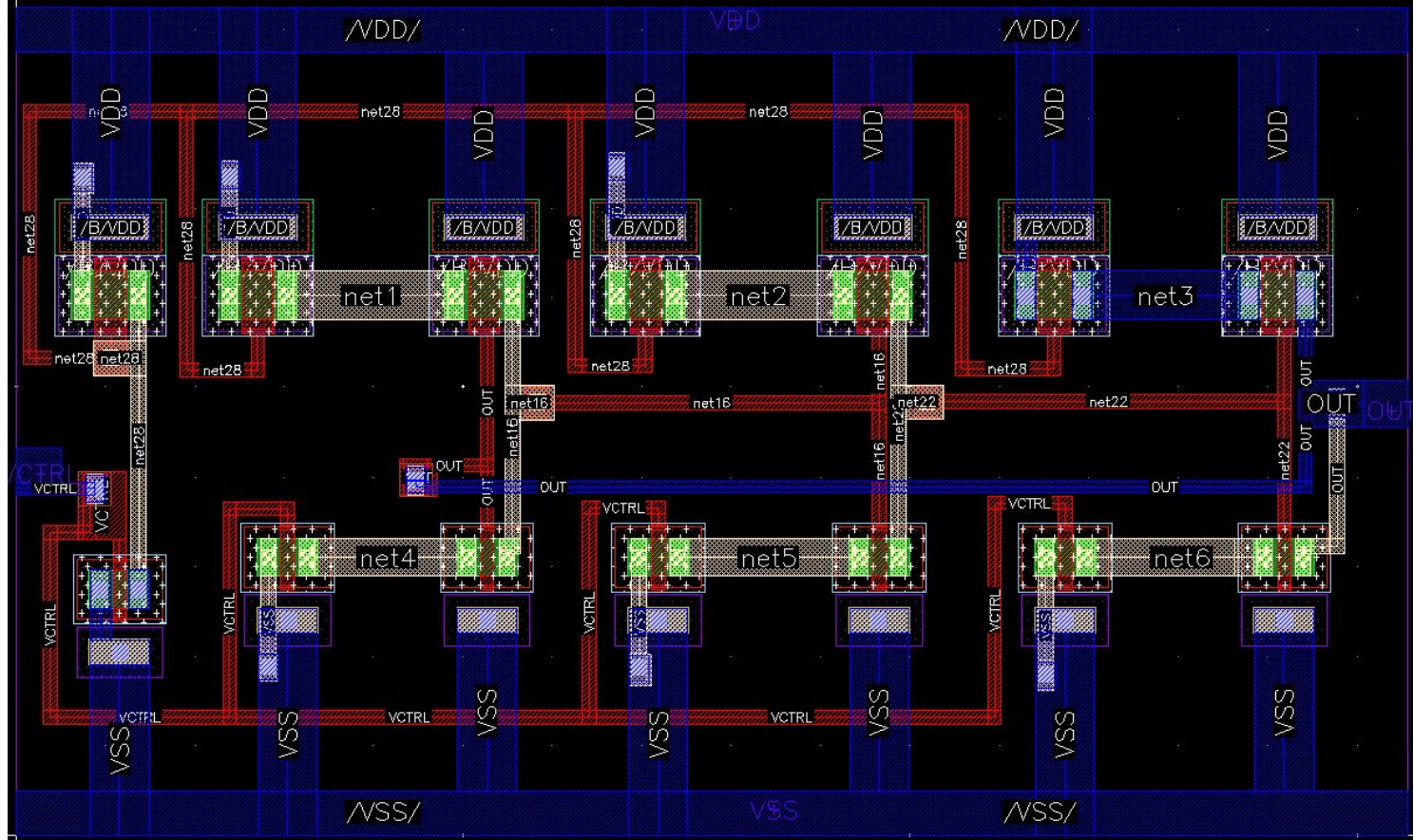


Average Power Draw



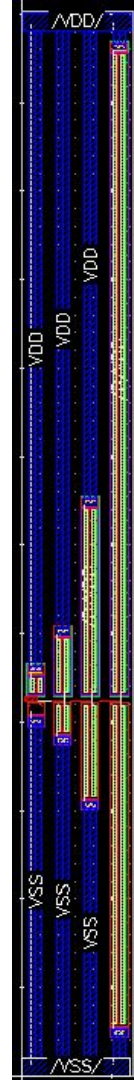
- Multiplied average current by 1.8 V

Result: 39.23 μ A



Layout - Oscillator

Layout - Buffer

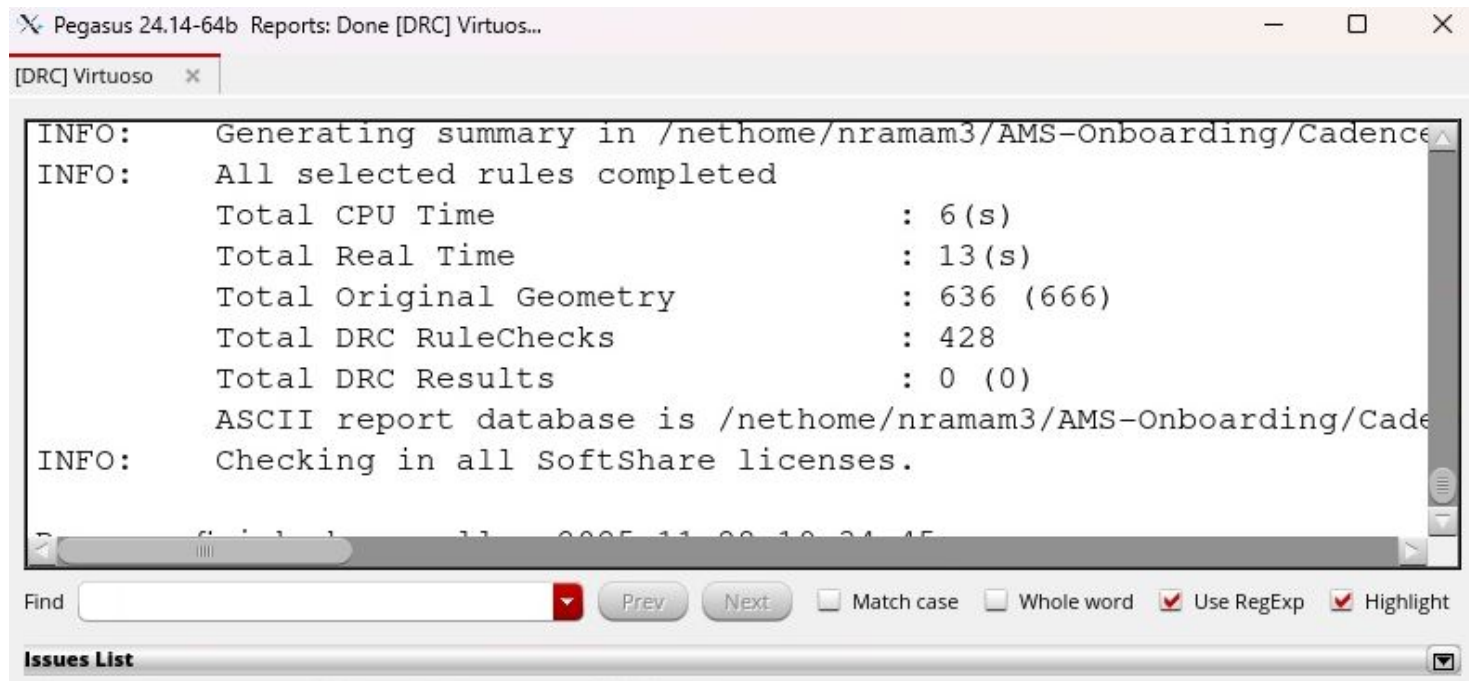


Passed DRC for Oscillator Block

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



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

```
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
```