

ECE4902 Project

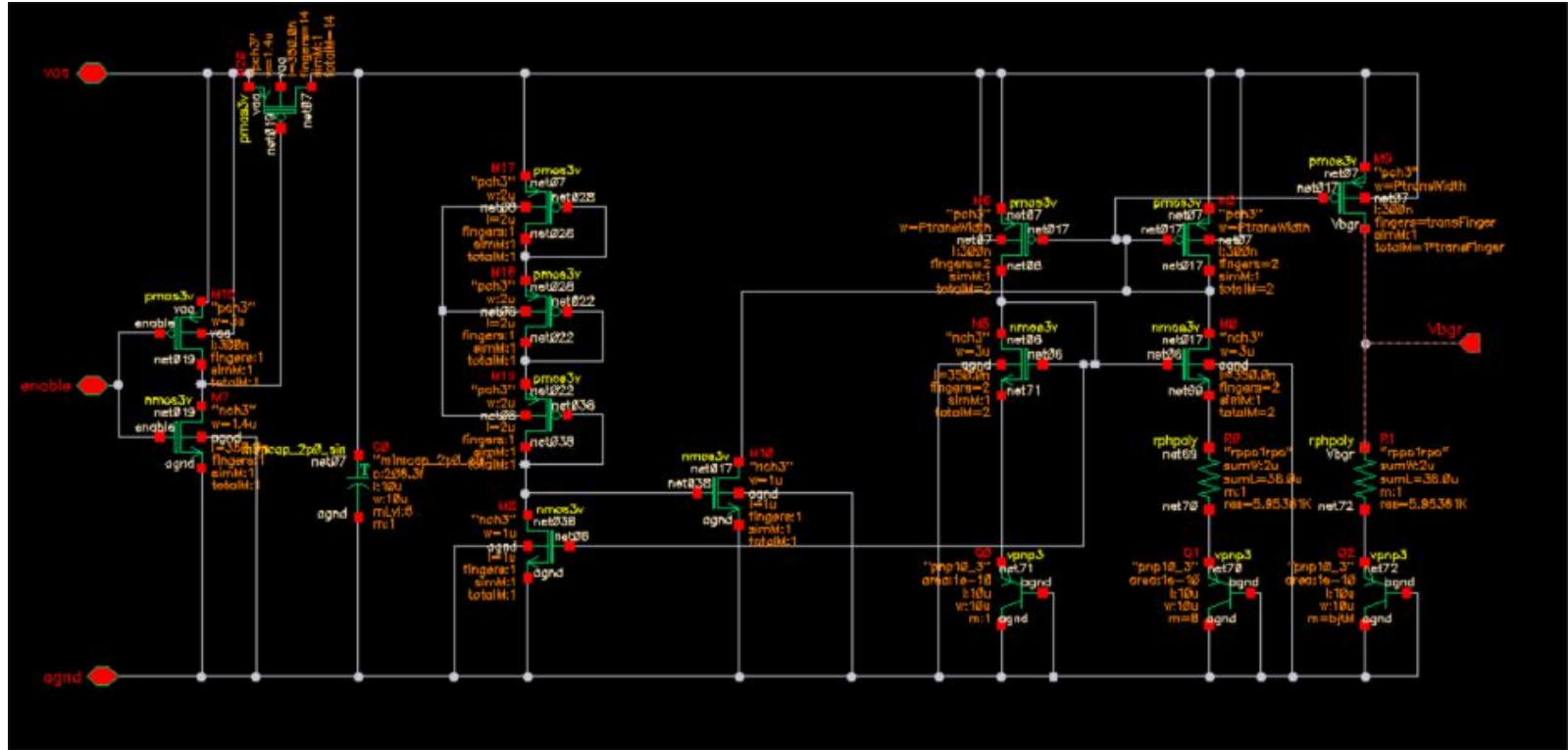
Team 6: OHM DEPOT

George S, Jason L, Matt H, and Jame S

Sections

- Bandgap Reference
- Bias Generator
- Operational Amplifier
- System Design

BGR: Design



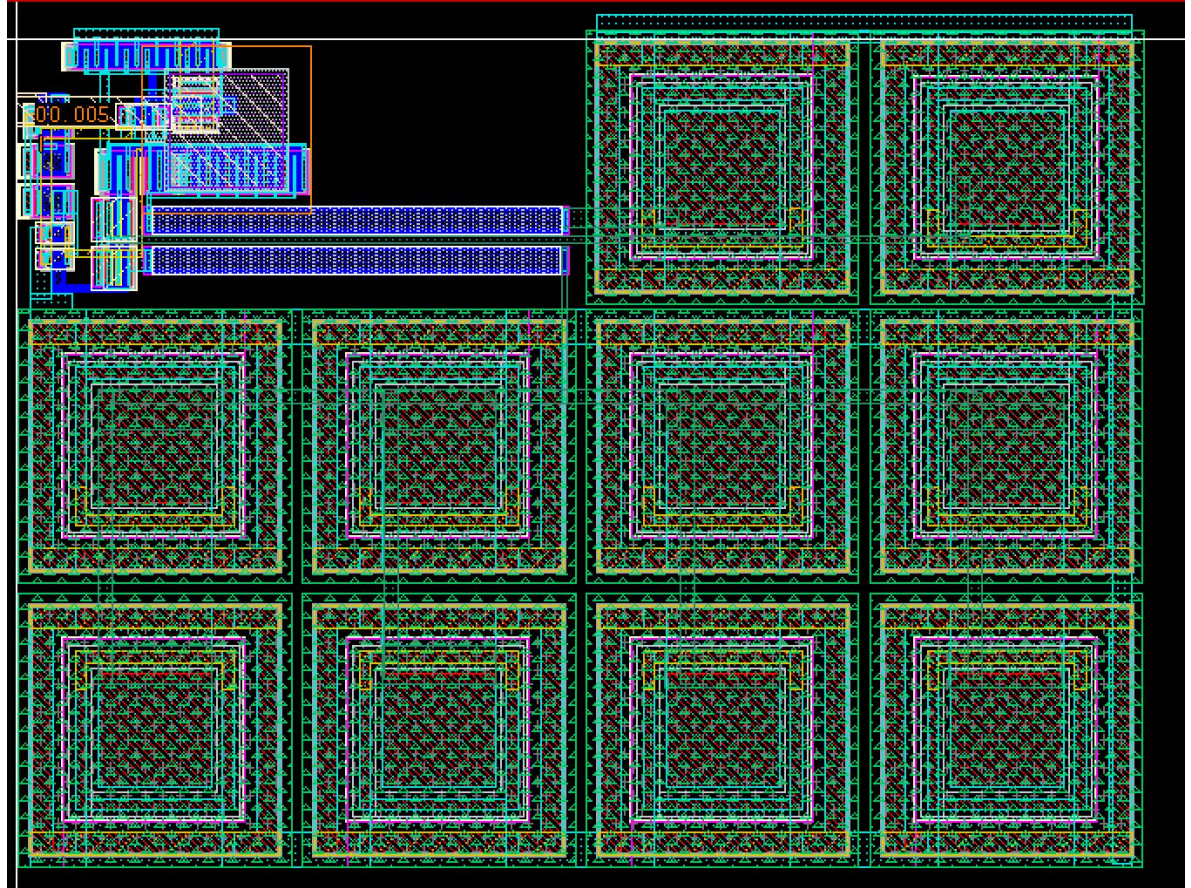
BGR: Pre-Layout Simulations



BGR: Layout

Final area:

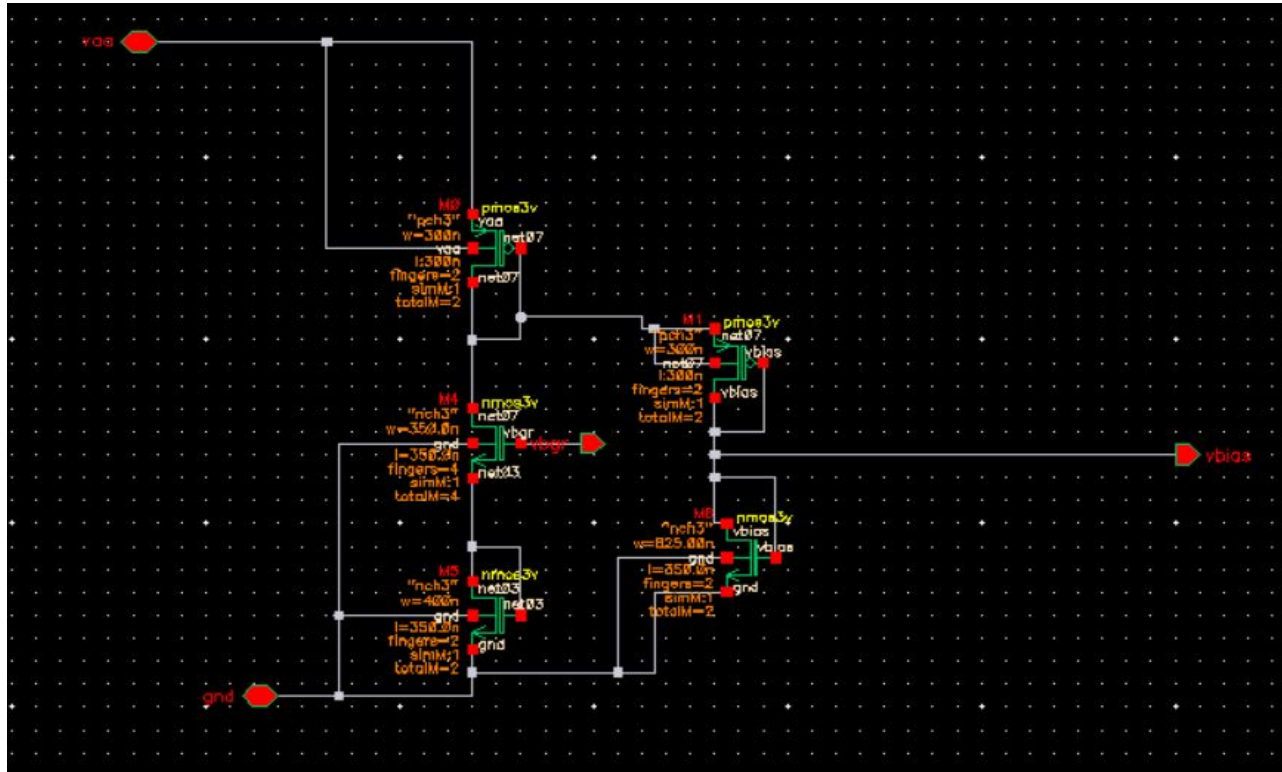
-7429.165 (um)^2



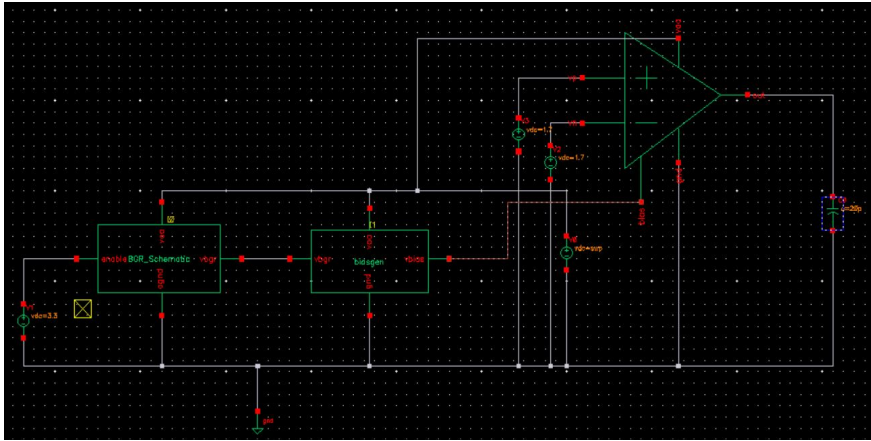
BGR: Post-Layout Simulations



Bias-Generator: Design

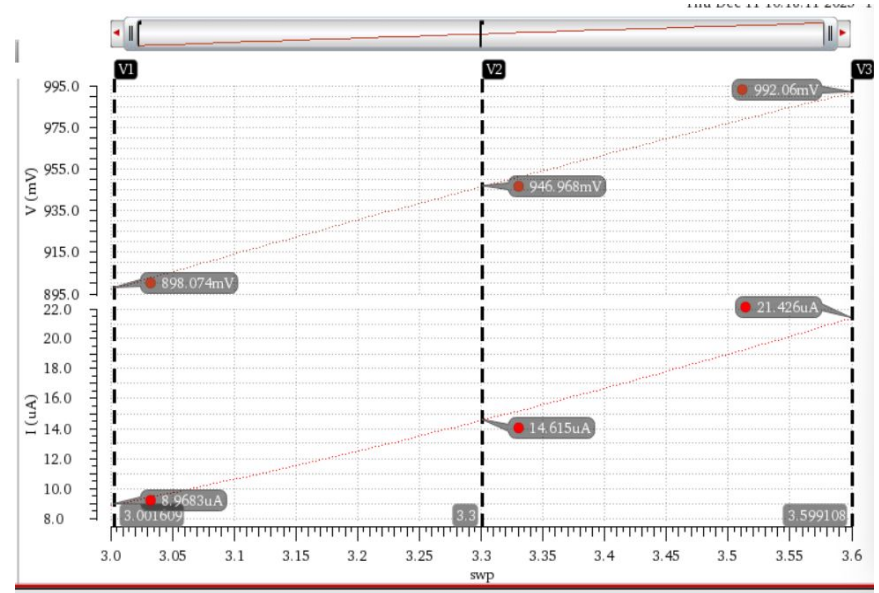


Bias-Generator: Pre-Layout Simulations

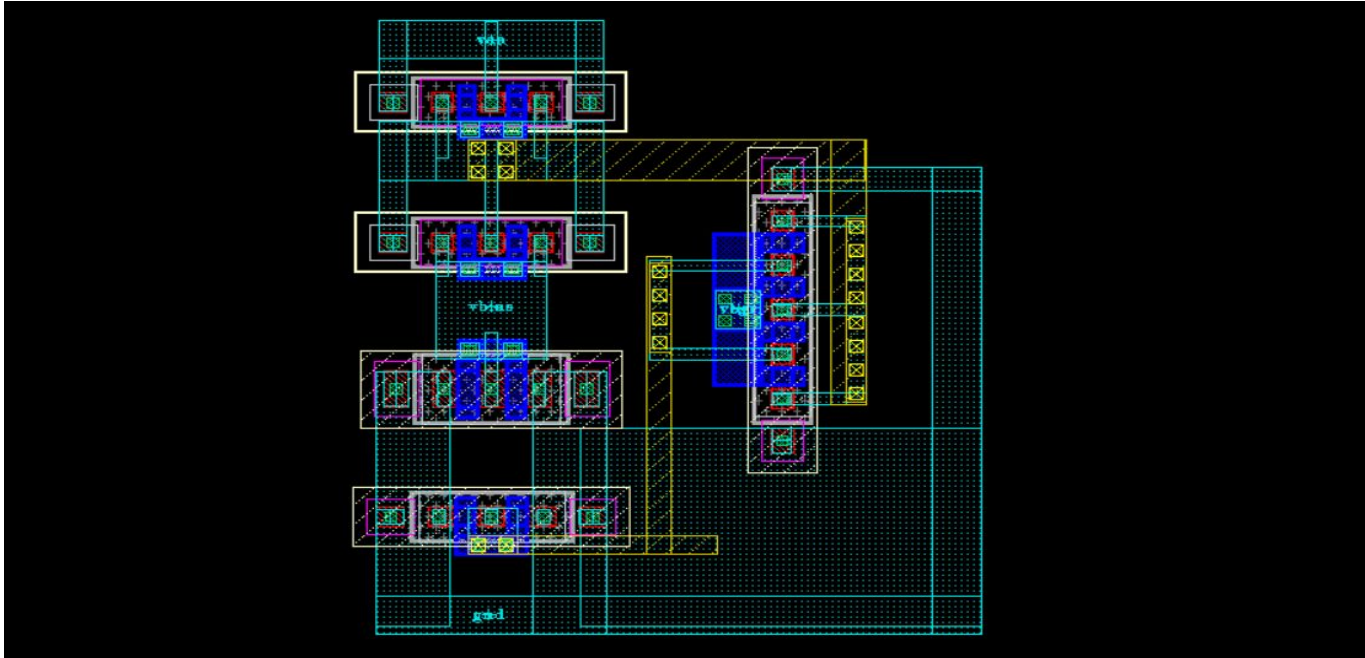


Power Consumption Worst Case: 77.1uW

Power Consumption Nominal: 48.2uW



Bias-Generator: Layout

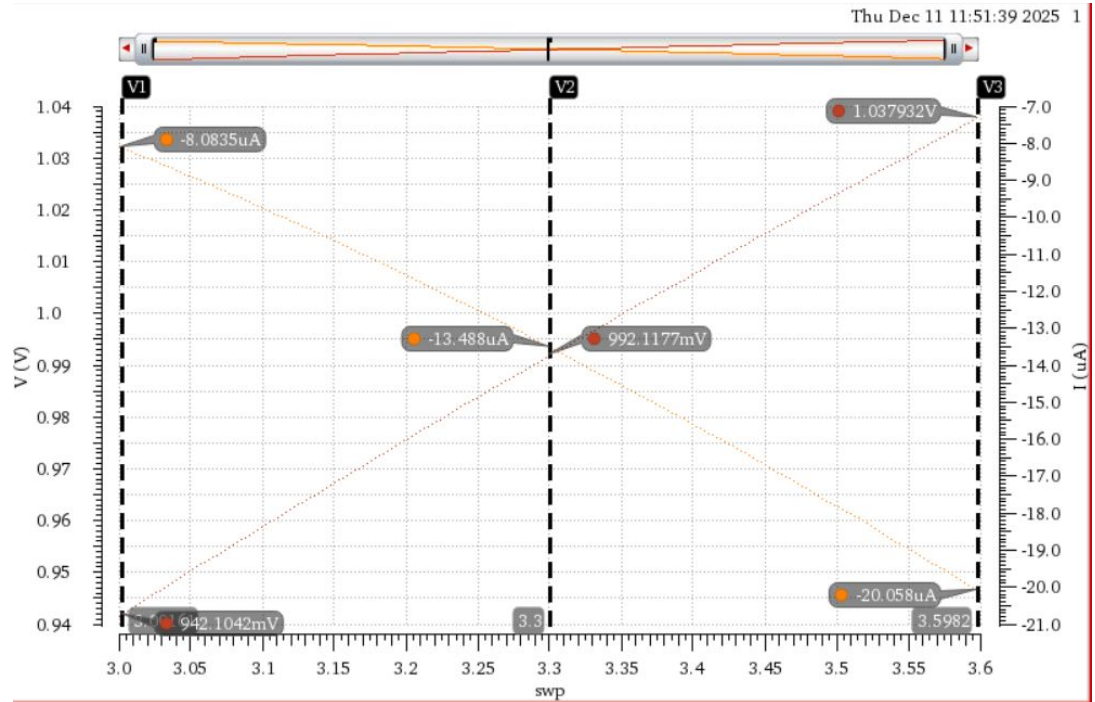


Final Area: 155.8um²

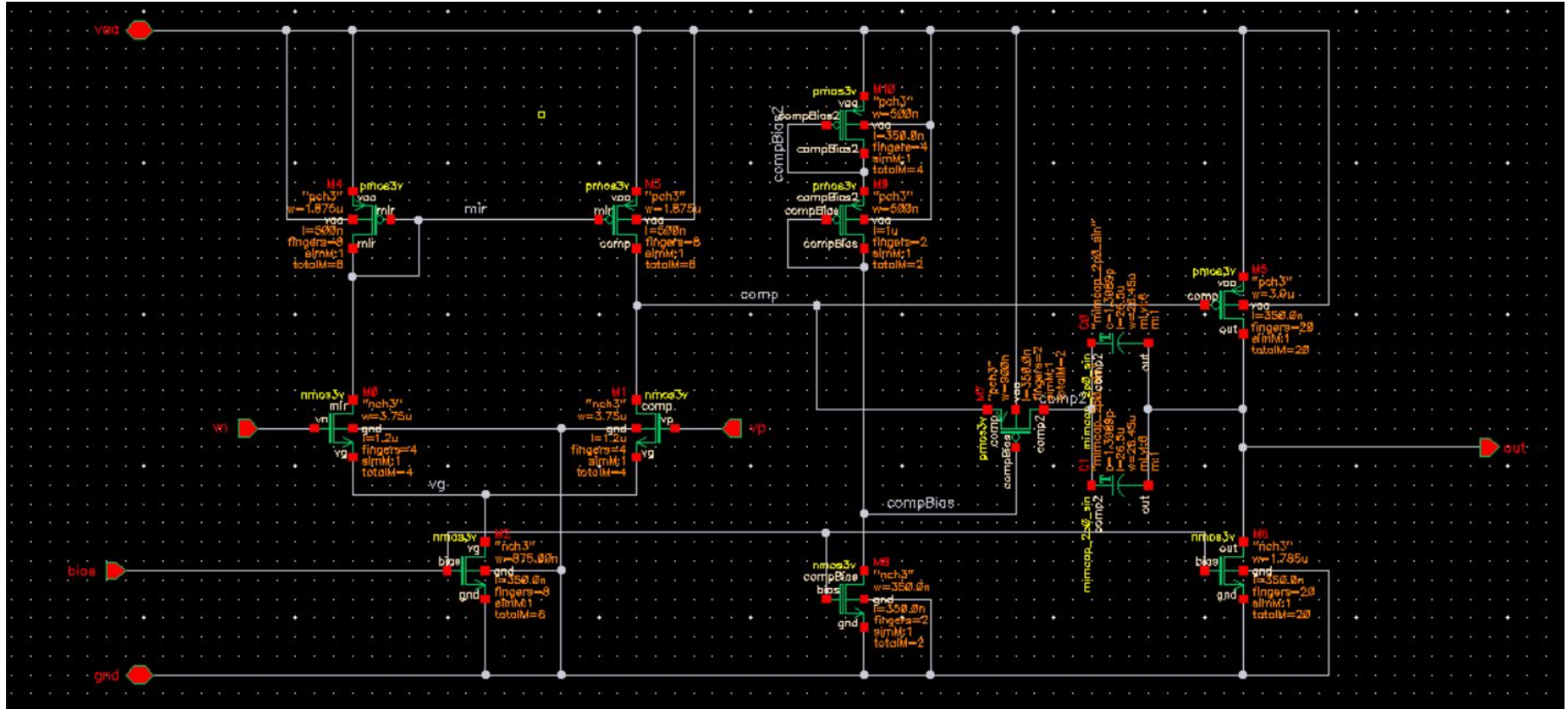
Bias-Generator: Post-Layout Sim

Power Consumption Worst Case:
72.2uW

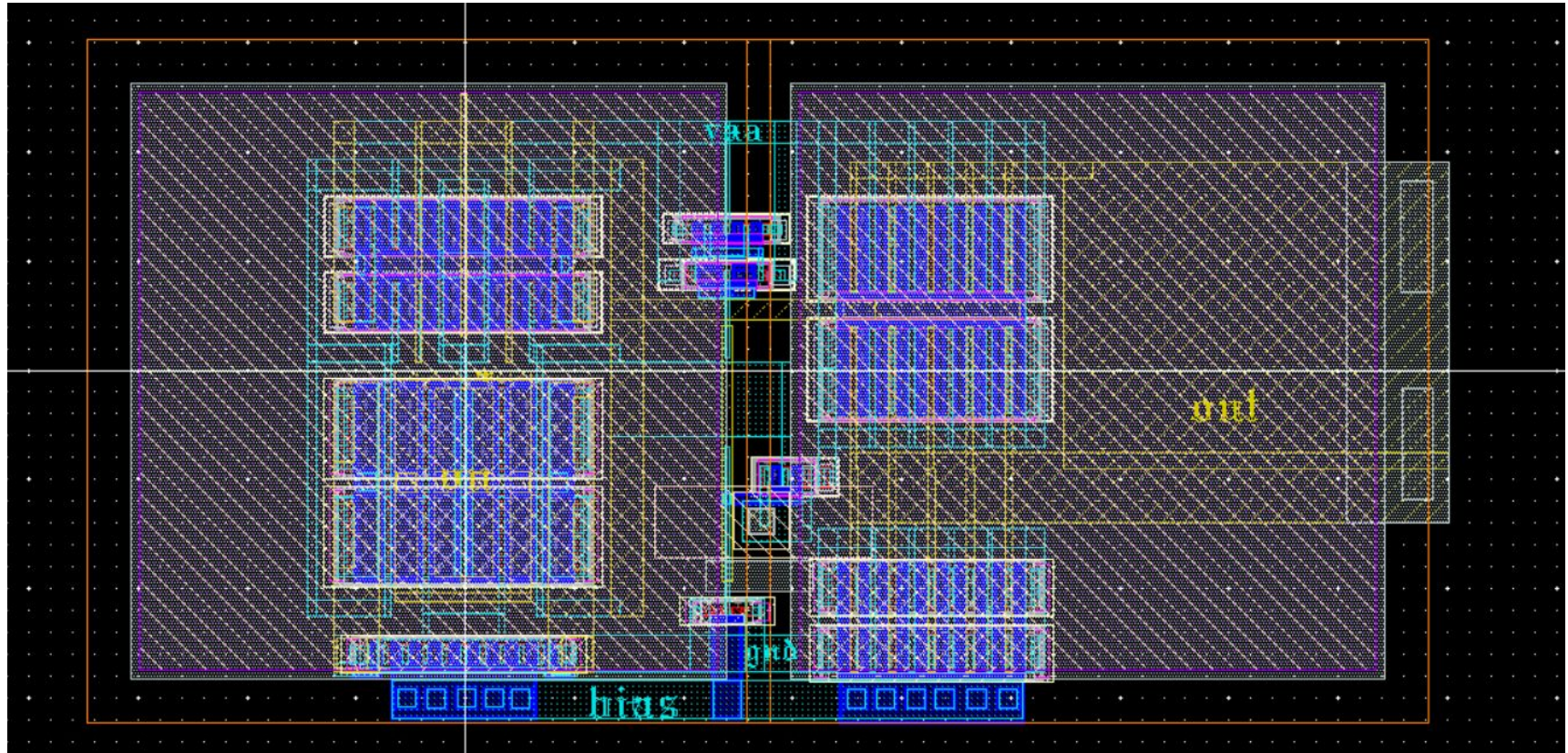
Power Consumption Nominal: 44.5uW



Opamp: Design



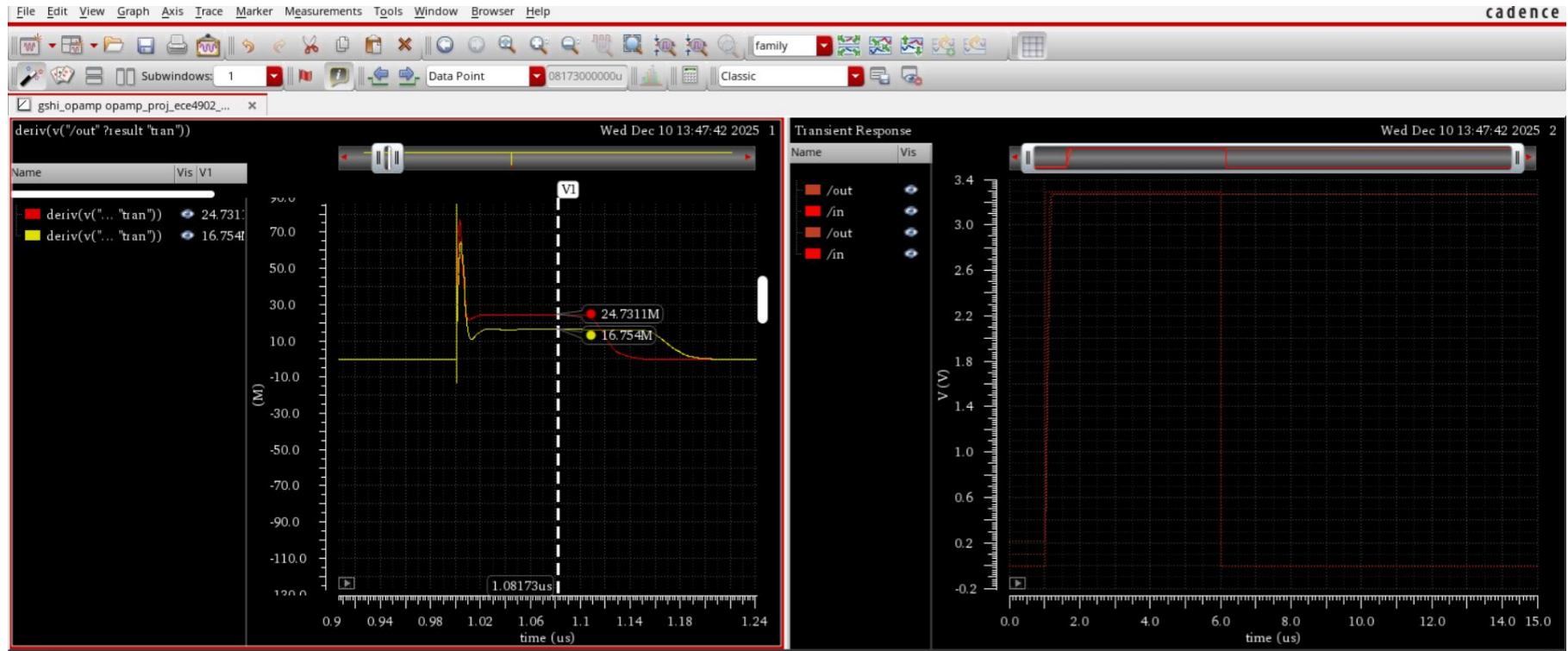
Opamp: Layout



Opamp: AC Simulations



Opamp: Transient Simulations

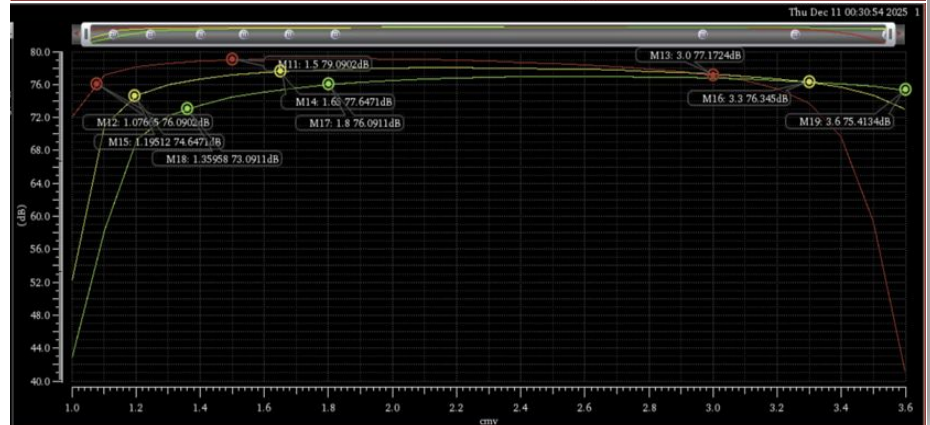
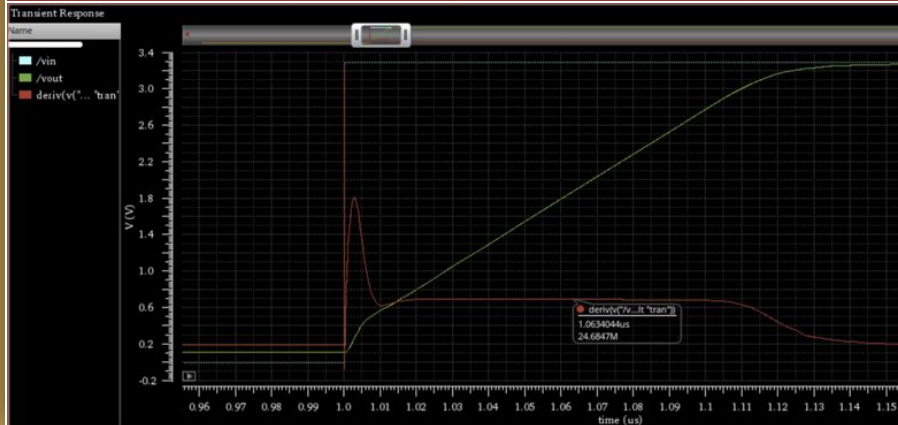
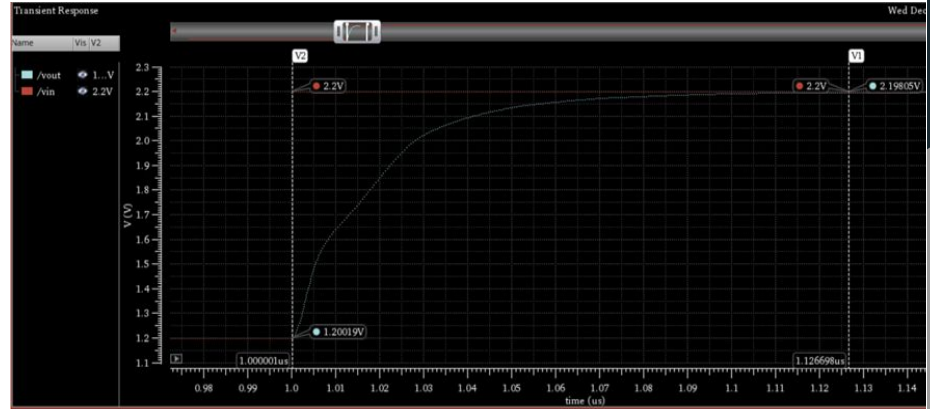
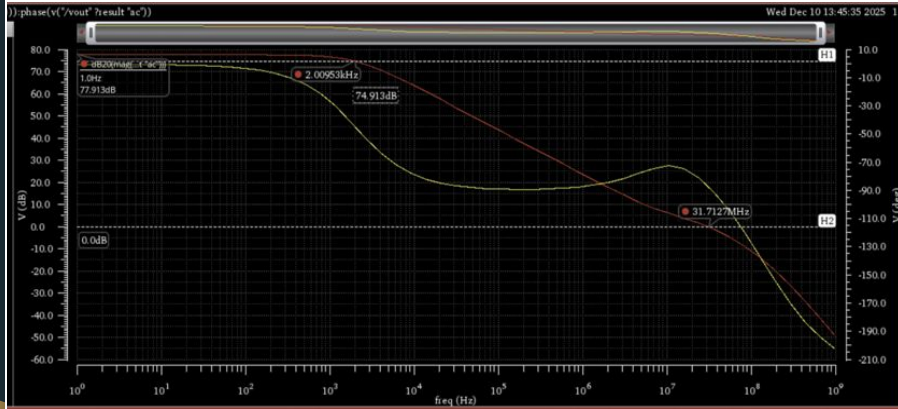


Opamp: Summary

Spec: 75 dB	Pre-Layout: 78.9 dB	Post-Layout: 24.5 dB
Spec: 60 PM	Pre-Layout: 93 PM	Post-Layout: 85 PM
Spec: 25 MHz	Pre-Layout: 32 MHz	Post-Layout: 3.1 MHz
Spec: 20 V/us	Pre-Layout: 24.7 V/us	Post-Layout: 16.5 V/us
Spec: 2V ICMR	Pre-Layout: 1.25V-3.25V	Post-Layout: 1.25V-3.25V

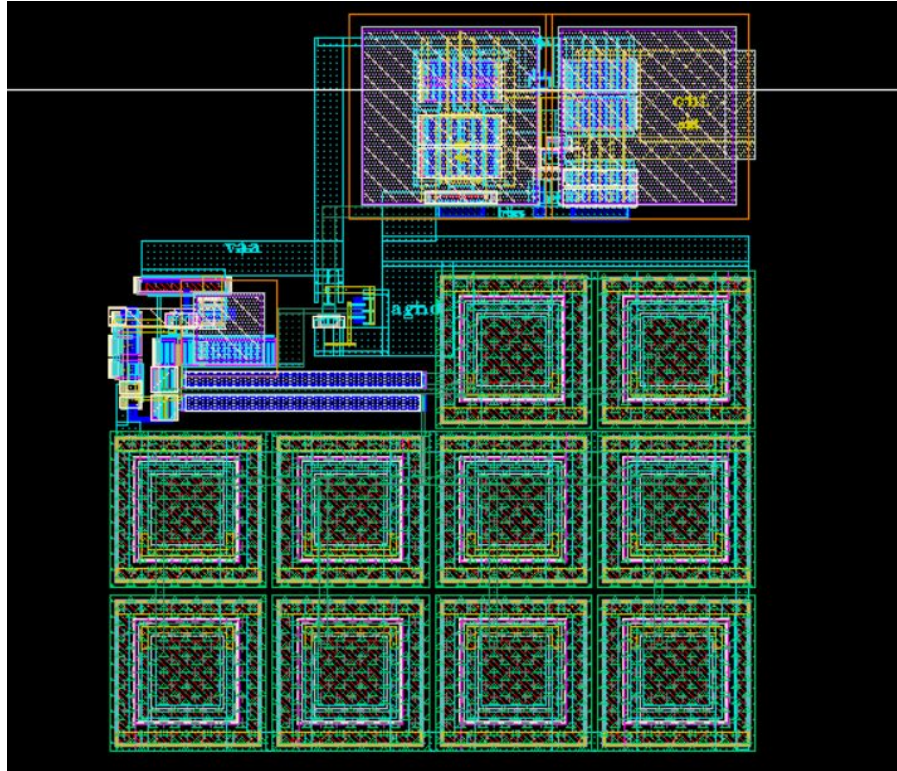
All tested with 20pF load capacitor

System: Pre-Layout Simulations



Corner	A _{V0} [dB]	PM [deg]	UGBW [MHz]	SR [V/μs]	ICMR [V]	V _{BGR} [V]	T _{Settle} [ns]	Power [mW]
Typical	77.6754	93.6950	30.3448	21.7579	2.03888	1.2480	126.698	2.0880
Vaa=3.0V	79.1991	96.4623	20.0169	13.8627	1.87335	1.1887	169.652	1.2387
Vaa=3.6V	75.4695	91.6516	40.1790	27.7372	2.16872	1.3083	103.037	3.2671
T = 0°C	79.0241	94.5327	29.8379	21.4012	2.04448	1.2481	120.238	1.9895
T=70°C	75.6353	92.1979	30.9746	21.4780	2.02839	1.2468	137.788	2.2378
SS Corner	78.4489	98.4706	18.6098	11.1815	1.98709	1.2021	223.449	1.3110
SF Corner	76.924	94.5615	33.8906	20.5164	1.98757	1.2574	143.606	2.2388
FS Corner	78.3066	91.1989	27.3176	23.4043	2.07418	1.2400	109.963	1.9539
FF Corner	75.9048	89.2821	43.7601	36.4151	1.94588	1.3061	075.391	3.1616
Worst Case	72.3874	87.844	8.2233	5.27519	1.77836	1.3739	231.715	4.7214
Best Case	82.0303	101.339	49.6117	61.8649	2.25343	1.1469	069.815	0.6320

System: Layout



Size: 11198.85 μm^2

System: Post-Layout Simulations

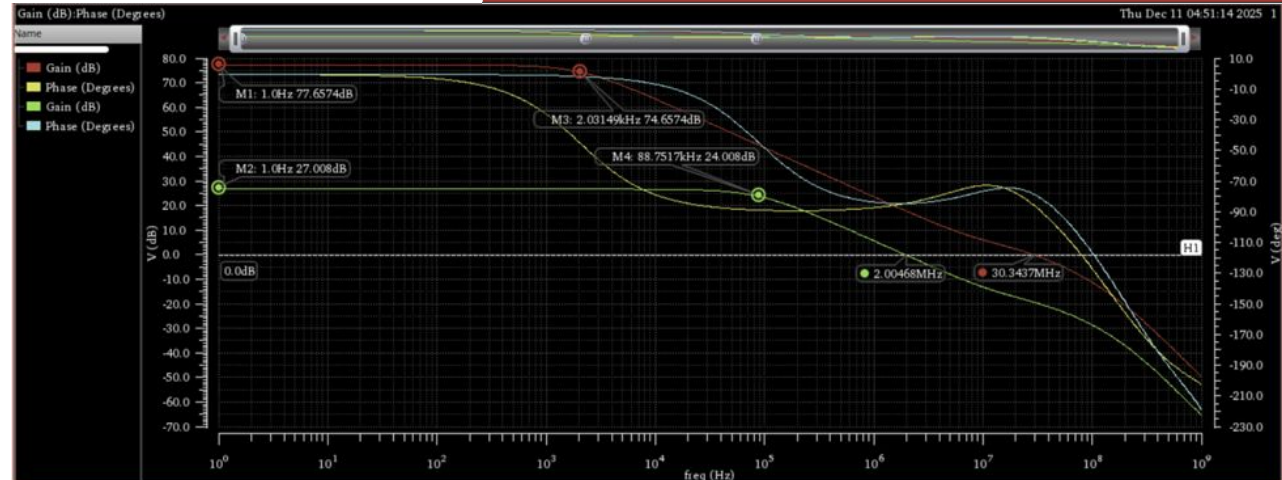
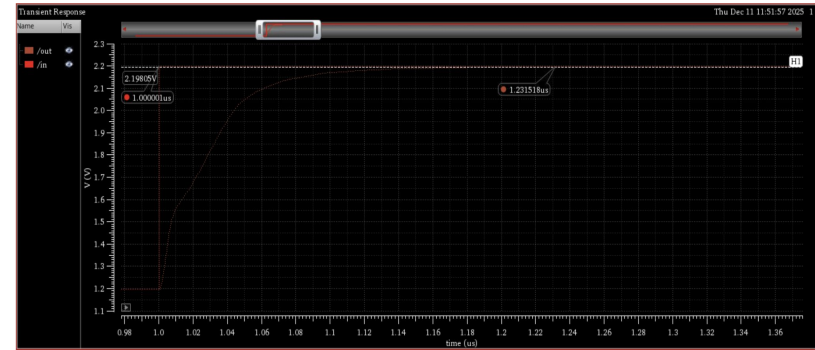
Open-Loop Gain: 27dB
BW: 88.75kHz
UGBW: 2.00MHz
Power: 2.2977mW
Slew Rate: 21.8V/ μ s
Phase Margin: 95.9°
Settling Time: 231.518ns
ICMR: 2.3264V
(907.552mV - 3.234V)

Best Case Corners

OL Gain (3.6V, 70°C, FF):
36.7726dB (68.9650 V/V)

UGBW (3.6V, 70°C, FF):
12.0419MHz

PM (3.6V, 70°C, FF):
110.316°



THANK YOU FROM THE OHM DEPOT!!!

