Challenging Design

- ## Values from ADT

DOF	Value
M1(L)	1u
M2(L)	1.5u
M4(L)	220n
M5(L)	300n
M1(GM/ID)	17
M4(GM/ID)	10
M5(GM/ID)	10
IB_Nominal	300u
CC_Nominal	250f
IB2/IB1	4

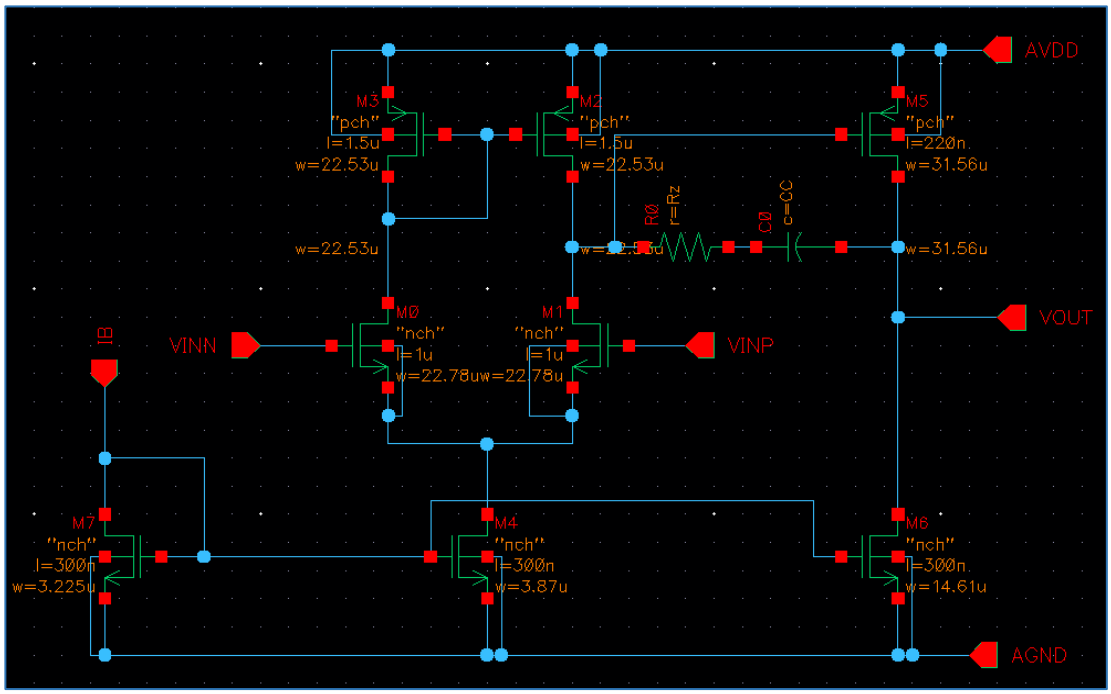
Output Variable	Nominal
DC Gain	2.249k
1st Stage Gain	89.39
2nd Stage Gain	25.17
DC PSR (dB)	-3.886
DC CMR (dB)	-6.654
Systematic Offset	0
Total Input ...	5.958u
Thermal Input ...	80.33a
Output Swing	1.4
BW	122.1k
UGF	155.6MEG
PM	50.31
Vout Max	1.6

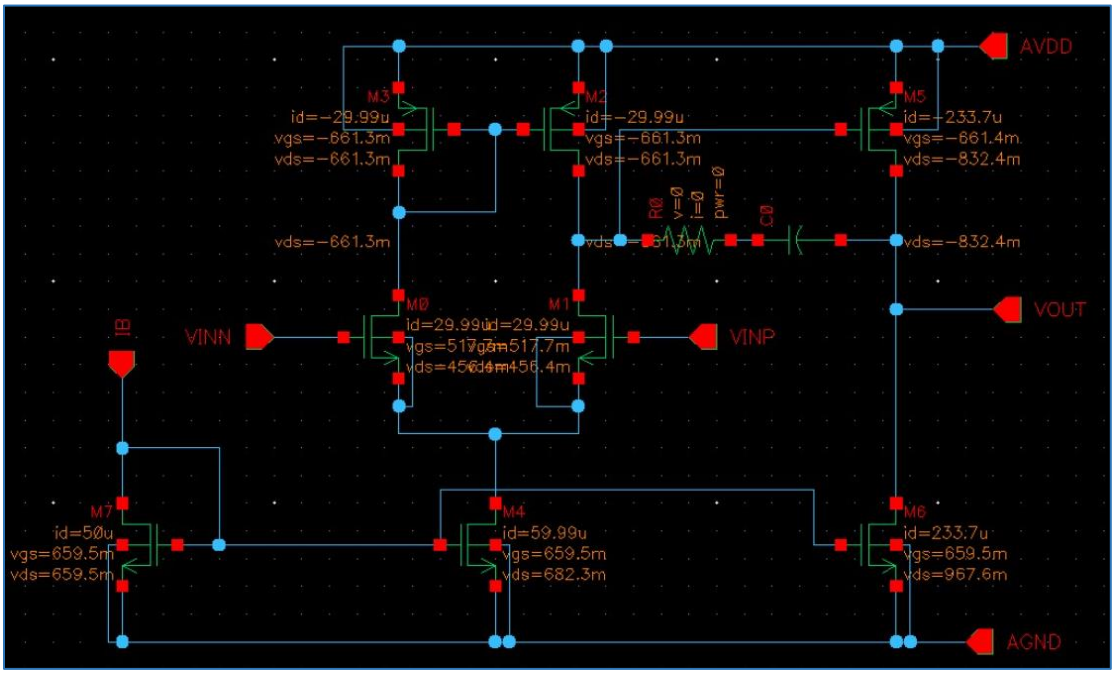
DOF	Value
M1(L)	1u
M2(L)	1.5u
M4(L)	220n
M5(L)	300n
M1(GM/ID)	17
M4(GM/ID)	10
M5(GM/ID)	10
IB_Nominal	300u
CC_Nominal	250f
IB2/IB1	4

Output Variable	Nominal
Vout Min	200m
Vin CM Min	765.8m
Vin CM Max	1.676
Slew Rate	240MEG
IB	300u
Cgg	167.1f
ΣW*L	125.6p
M1(W)	22.78u
M2(W)	22.53u
M3(W)	3.87u
M4(W)	31.56u
M5(W)	14.61u
Rz	451.5

Design Variables					
CC		275f	225f	275f	225f
Rz		496.65	406.35	406.35	496.65

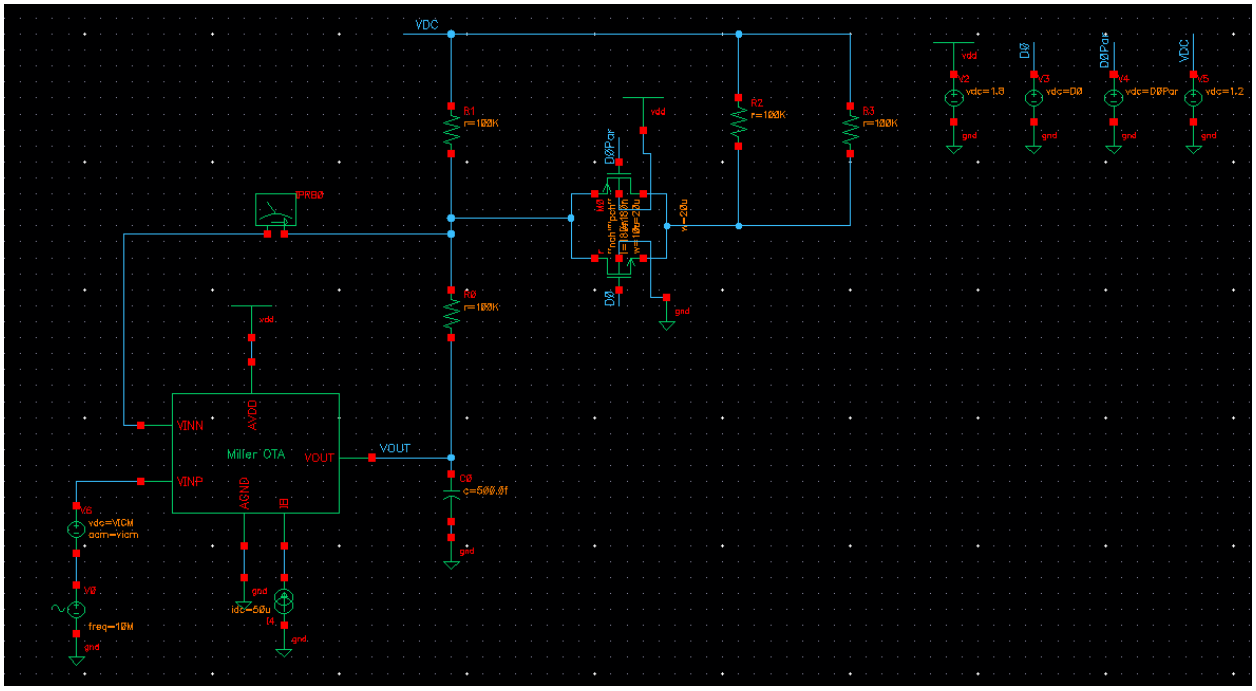
- **Open Loop**

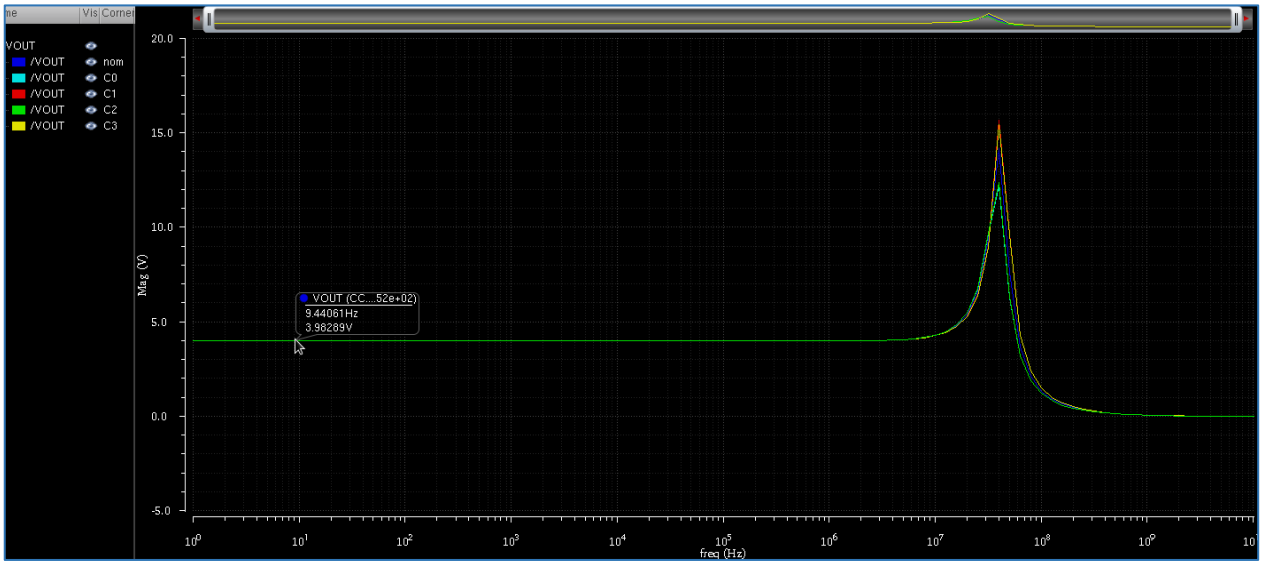




Test	Output	Nominal	Spec	Weight	Pass/Fail	Min	Max	C0	C1	C2	C3
ITI_ANALOG2:Labo12_TB_open:1	ymax(mag(v("/VOUT" ?result...	2.161k				2.161k	2.161k	2.161k	2.161k	2.161k	2.161k
ITI_ANALOG2:Labo12_TB_open:1	ymax(dB20(v("/VOUT" ?resul...	66.69				66.69	66.69	66.69	66.69	66.69	66.69
ITI_ANALOG2:Labo12_TB_open:1	unityGainFreq(v("/VOUT" ?r...	155.1M				147.1M	166.5M	147.3M	166.2M	147.1M	166.5M
ITI_ANALOG2:Labo12_TB_open:1	phaseMargin(v("/VOUT" ?re...	49.86				47.95	51.67	51.67	47.95	50.52	48.98

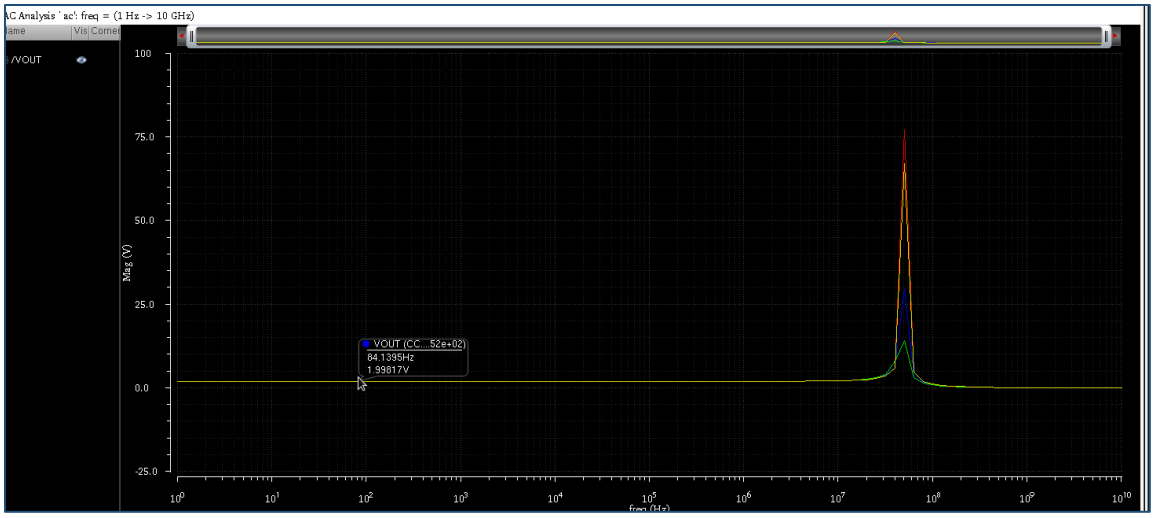
- **Closed Loop**





	Parameter	Nominal						C0	C1	C2	C3
	CC	250f						275f	225f	275f	225f
	Rz	451.5						496.6	406.4	406.4	496.6

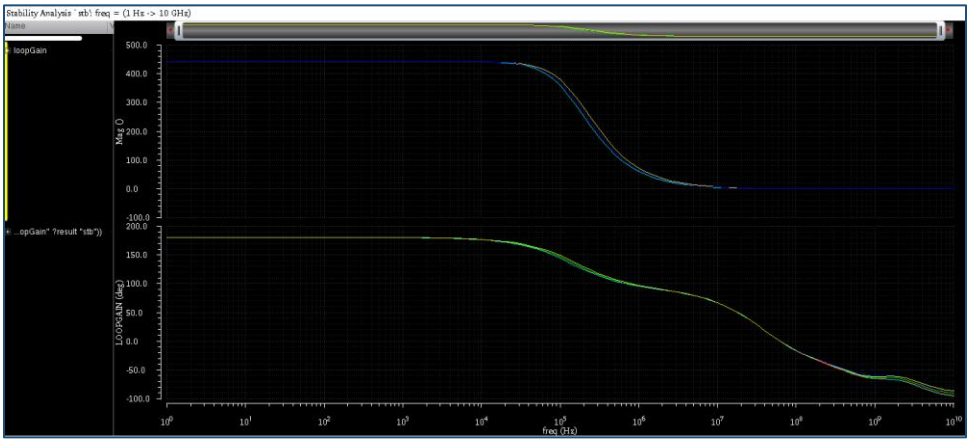
Test	Output	Nominal	Spec	Weight	Pass/Fail	Min	Max	C0	C1	C2	C3
ITI_ANALOG2:Labo12_TB_closed:1	unityGainFreq(v("/VOUT" ?r...	120.6M				114.5M	126.9M	114.6M	126.7M	114.5M	126.9M



	Parameter	Nominal						C0	C1	C2	C3
	CC	250f						275f	225f	275f	225f
	Rz	451.5						496.6	406.4	406.4	496.6
Test	Output	Nominal	Spec	Weight	Pass/Fail	Min	Max	C0	C1	C2	C3
ITI_ANALOG2:Labo12_TB_closed:1	unityGainFreq(v("/VOUT" ?r...	100.8M				96.95M	108.9M	97.03M	108.8M	96.95M	108.9M

- **for closed loop the gain decreases and hence BW increases to have aprox constant UGF**

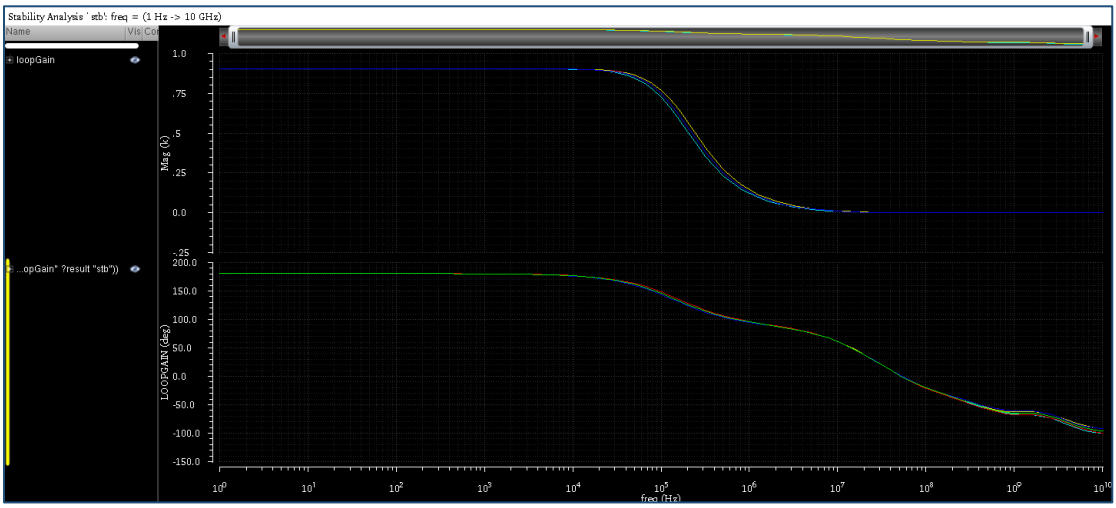
- **Stb Analysis (Gain = 4 then Gain =2)**



	1	2
Rz	406.4	496.7
/phaseMargin CC 2.25e-13 (Deg)	18.30	18.56
/phaseMargin CC 2.75e-13 (Deg)	22.80	23.09
Rz	451.5	
/phaseMargin CC 2.5e-13 (Deg)	20.78	

	Parameter	Nominal					C0	C1	C2	C3
	CC	250f					275f	225f	275f	225f
	Rz	451.5					496.6	406.4	406.4	496.6

Test	Output	Nominal	Spec	Weight	Pass/Fail	Min	Max	C0	C1	C2	C3
ITI_ANALOG2:Labo12_TB_closed:1	unityGainFreq(getData("loop...	38.15M				36.47M	39.86M	36.47M	39.85M	36.47M	39.86M
ITI_ANALOG2:Labo12_TB_closed:1	ymax(dB20(getData("loopGai...	52.91				52.91	52.91	52.91	52.91	52.91	52.91



	1	2
Rz	406.4	496.7
/phaseMargin CC 2.25e-13 (Deg)	1.319	1.652
/phaseMargin CC 2.75e-13 (Deg)	4.903	5.283
Rz	451.5	
/phaseMargin CC 2.5e-13 (Deg)	3.365	

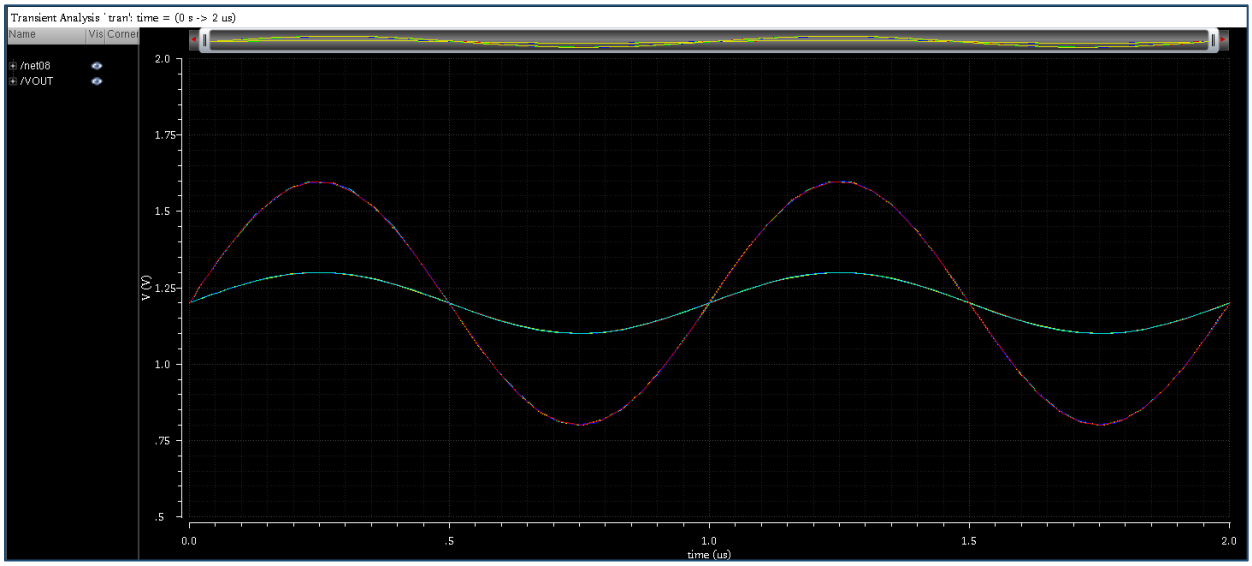
	Parameter	Nominal						C0	C1	C2	C3
	CC	250f						275f	225f	275f	225f
	Rz	451.5						496.6	406.4	406.4	496.6

Test	Output	Nominal	Spec	Weight	Pass/Fail	Min	Max	C0	C1	C2	C3
ITI_ANALOG2:Labo12_TB_closed:1	unityGainFreq(getData("loop...	48.69M				46.93M	50.74M	46.93M	50.73M	46.93M	50.74M
ITI_ANALOG2:Labo12_TB_closed:1	ymax(dB20(getData("loopGai...	59.1				59.1	59.1	59.1	59.1	59.1	59.1

- **for STB ugf and loop gain decreaes by 4 when gain = 4 and by 2 when gain=2**
- **the peakig occured due to the feed forward zero appears at certain freq we can avoid the peaking by adding pole at this freq to cancel the zero**
- **cap in parralel with the feedback resistor F=1/2pi RC hence we can pick a value for the cap**

- **Transient Analysis**

Gain=4



Gain=2