(*) reqd^ gain $= -70\frac{V}{V} = -37dB$

## ↳ Cascoded Amp calculations —

(1) $I_1 = C_L \times SR = 10 \times 10^{-12} \times 10 \times 10^6$

$= 100\mu A$

$I_2 = \frac{P_{dispp}}{V_{DD}} = \frac{1 \times 10^{-3}}{1.8} = 556\mu A$

$I_1 < I < I_2$ [taking near about 100μA to compensate with reqd^ gain and (w/L) ratios].

(2) $V_{out(max)} = V_{DD} - V_{SD3}$

$1.7 = 1.8 - \sqrt{\frac{2 \times 100}{61.4 (w/L)_3}}$

$(0.1)^2 = \frac{3.25}{(w/L)_3} = .01$

$\Rightarrow (w/L)_3 = 325.75289 = (w/L)_4$

$\because L = 180nm \Rightarrow w = 58531.92182 nm$

(3) $A_V = \frac{g_{m1}}{g_{ds3}} = \sqrt{\frac{2\beta_1}{I}} \times \frac{1}{\lambda_p}$

$(-70)^2 \times (.09)^2 = \frac{2 \times 122.8}{100} (w/L)_1$

$(w/L)_1 = 16.16042$

$\because L = 180nm \quad \therefore w = 2908.87622 nm$

④ $V_{out(min)} = V_{DSM_2} + V_{DSM_1}$

$$0.6 = \sqrt{\frac{2I}{\beta_2}} + \sqrt{\frac{2I}{\beta_1}}$$

$$0.6 - \sqrt{\frac{2\times100}{122.8\times16.16}} = \sqrt{\frac{2I}{\beta_2}}$$

$$(0.2825)^2 = .08 = \frac{2\times100}{122.8\times(W/L)_2}$$

$$\therefore (W/L)_2 = 20.35$$

$$\because L = 180nm \Rightarrow W_2 = 3672.467955nm$$

⑤ $V_{GG_2} = 0.317 + 0.4 + \sqrt{\frac{2I}{\beta_2}}$

$\hookrightarrow 0.28$

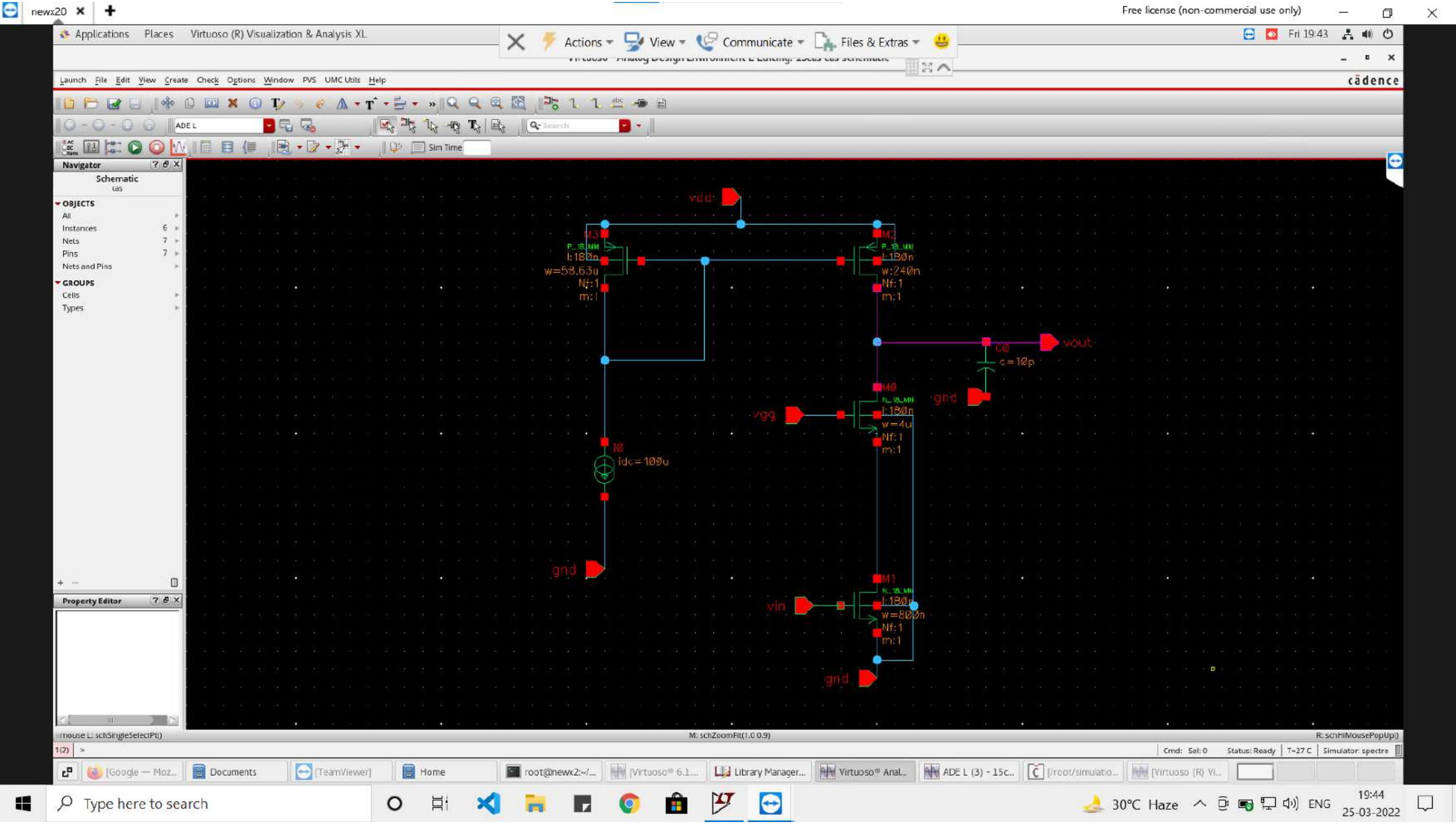
$= 0.997$

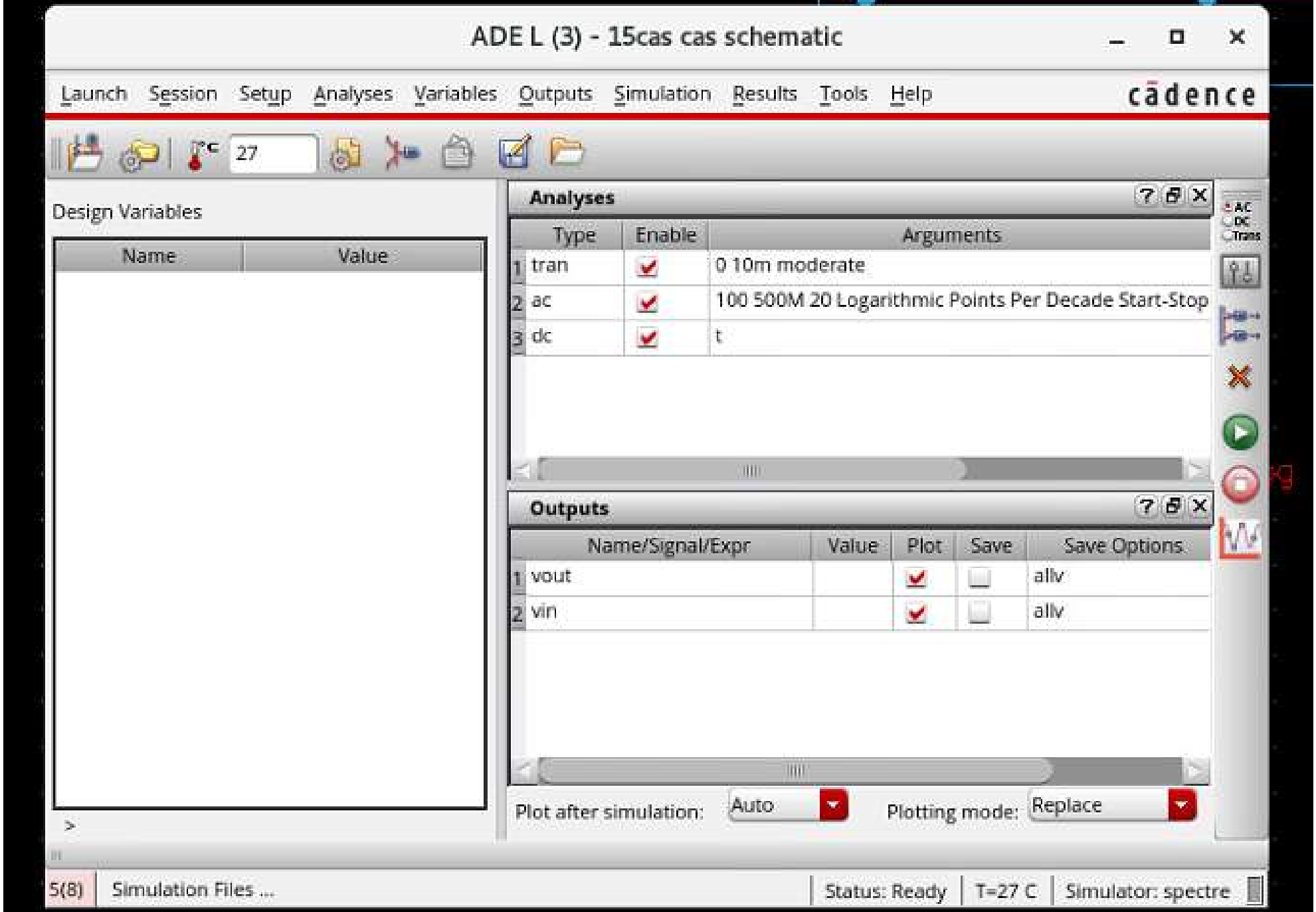
(*)⑥ we will also find Vin dc bias value to accurately get gain required –

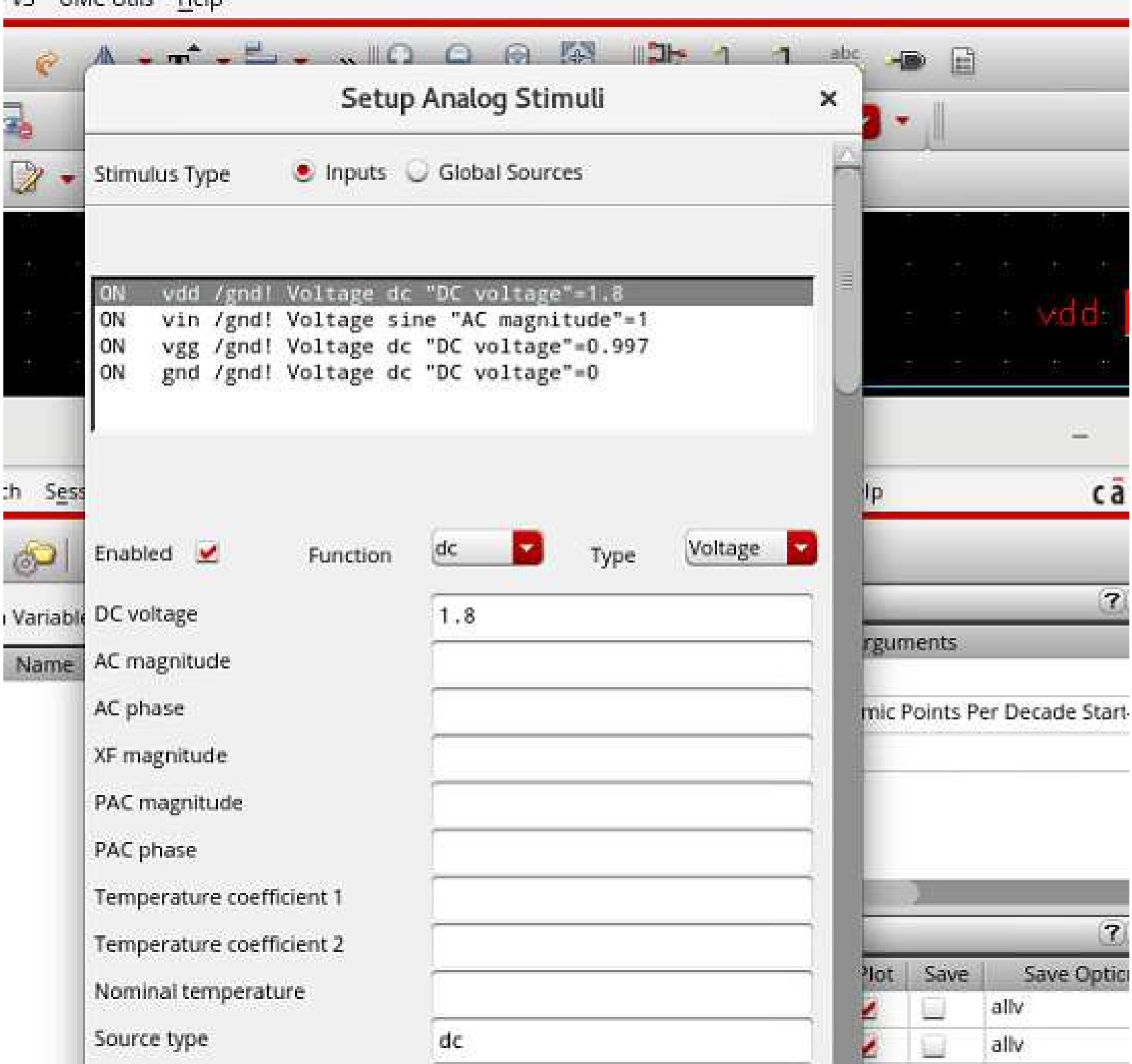
$$V_{in} = V_{th} + V_{ON}$$

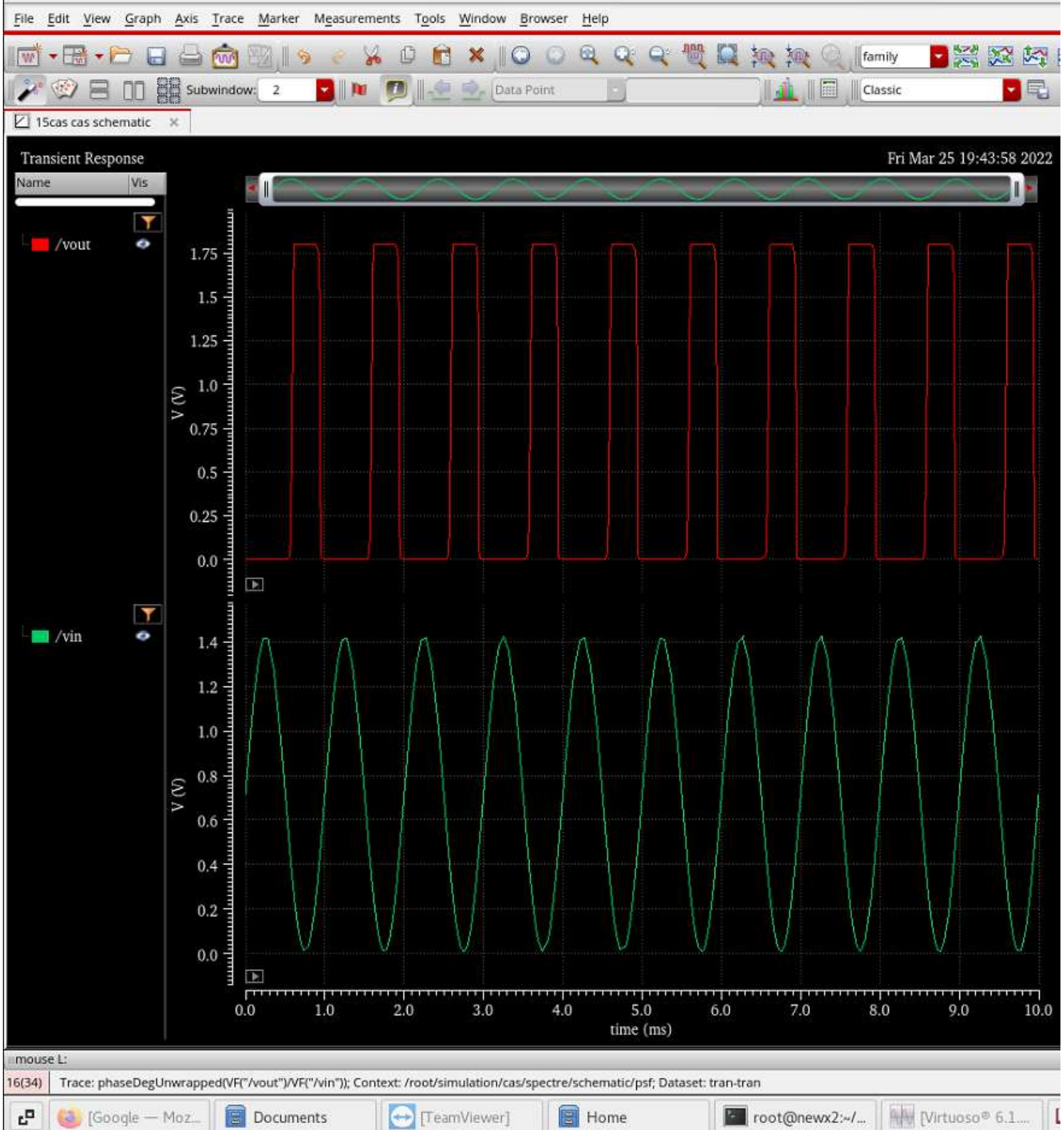
$$= 0.4 + \sqrt{\frac{2\times100}{122.8\times16.160442}}$$

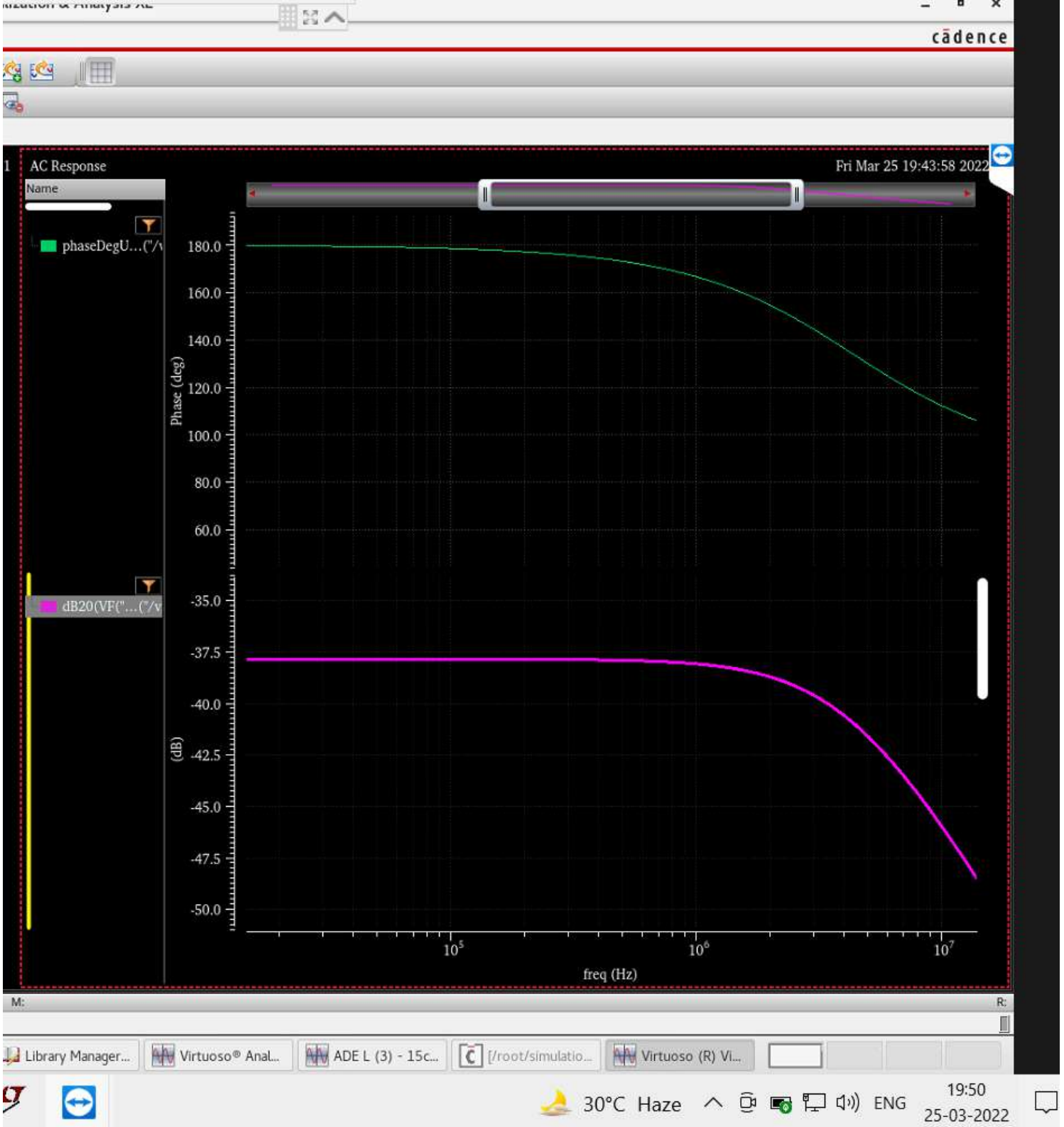
$$= 0.717460\ V$$


newx20
Free license (non-commercial use only)
Applications
Places
Virtuoso (R) Visualization & Analysis XL
Actions
View
Communicate
Files & Extras
Fri 19:43
Launch File Edit View Create Check Options Window PVS UMC Utils Help
cadence
Navigator
Schematic
OBJECTS
All
Instances 6
Nets 7
Pins 7
Nets and Pins
GROUPS
Cells
Types
Property Editor
vdd
M3
P_18_MM
l:180n
w=58.63u
Nf:1
m:1
M2
P_18_MM
l:180n
w:240n
Nf:1
m:1
C0
c=10p
vout
gnd
M0
N_18_MM
l:180n
w=4u
Nf:1
m:1
vgg
I0
idc=100u
gnd
M1
N_18_MM
l:180n
w=800n
Nf:1
m:1
vin
gnd
Sim Time
mouse L: schSingleSelectPt()
M: schZoomFit(1.0 0.9)
R: schHiMousePopUp()
Cmd: Sel: 0
Status: Ready
T=27 C
Simulator: spectre
Type here to search
30°C Haze
ENG
19:44
25-03-2022


ADE L (3) - 15cas cas schematic
Launch Session Setup Analyses Variables Outputs Simulation Results Tools Help
cadence
27
Design Variables
Name Value
Analyses
Type Enable Arguments
1 tran 0 10m moderate
2 ac 100 500M 20 Logarithmic Points Per Decade Start-Stop
3 dc t
Outputs
Name/Signal/Expr Value Plot Save Save Options
1 vout allv
2 vin allv
Plot after simulation: Auto
Plotting mode: Replace
5(8) Simulation Files ...
Status: Ready
T=27 C
Simulator: spectre


Setup Analog Stimuli
Stimulus Type
Inputs
Global Sources
ON vdd /gnd! Voltage dc "DC voltage"=1.8
ON vin /gnd! Voltage sine "AC magnitude"=1
ON vgg /gnd! Voltage dc "DC voltage"=0.997
ON gnd /gnd! Voltage dc "DC voltage"=0
Enabled
Function
dc
Type
Voltage
DC voltage
1.8
AC magnitude
AC phase
XF magnitude
PAC magnitude
PAC phase
Temperature coefficient 1
Temperature coefficient 2
Nominal temperature
Source type
dc
vdd
Name
Save
allv
allv


File Edit View Graph Axis Trace Marker Measurements Tools Window Browser Help
family
Subwindow: 2
Data Point
Classic
15cas cas schematic
Transient Response
Fri Mar 25 19:43:58 2022
Name
Vis
/vout
/vin
V (V)
V (V)
1.75
1.5
1.25
1.0
0.75
0.5
0.25
0.0
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
time (ms)
mouse L:
16(34)
Trace: phaseDegUnwrapped(VF("/vout")/VF("/vin")); Context: /root/simulation/cas/spectre/schematic/psf; Dataset: tran-tran
[Google — Moz...
Documents
[TeamViewer]
Home
root@newx2:~/...
[Virtuoso® 6.1....


cadence
AC Response
Fri Mar 25 19:43:58 2022
Name
phaseDegU...("/v
dB20(VF("...("/v
180.0
160.0
140.0
120.0
100.0
80.0
60.0
Phase (deg)
-35.0
-37.5
-40.0
-42.5
-45.0
-47.5
-50.0
(dB)
$10^5$
$10^6$
$10^7$
freq (Hz)
M:
R:
Library Manager...
Virtuoso® Anal...
ADE L (3) - 15c...
[/root/simulatio...
Virtuoso (R) Vi...
30°C Haze
ENG
19:50
25-03-2022