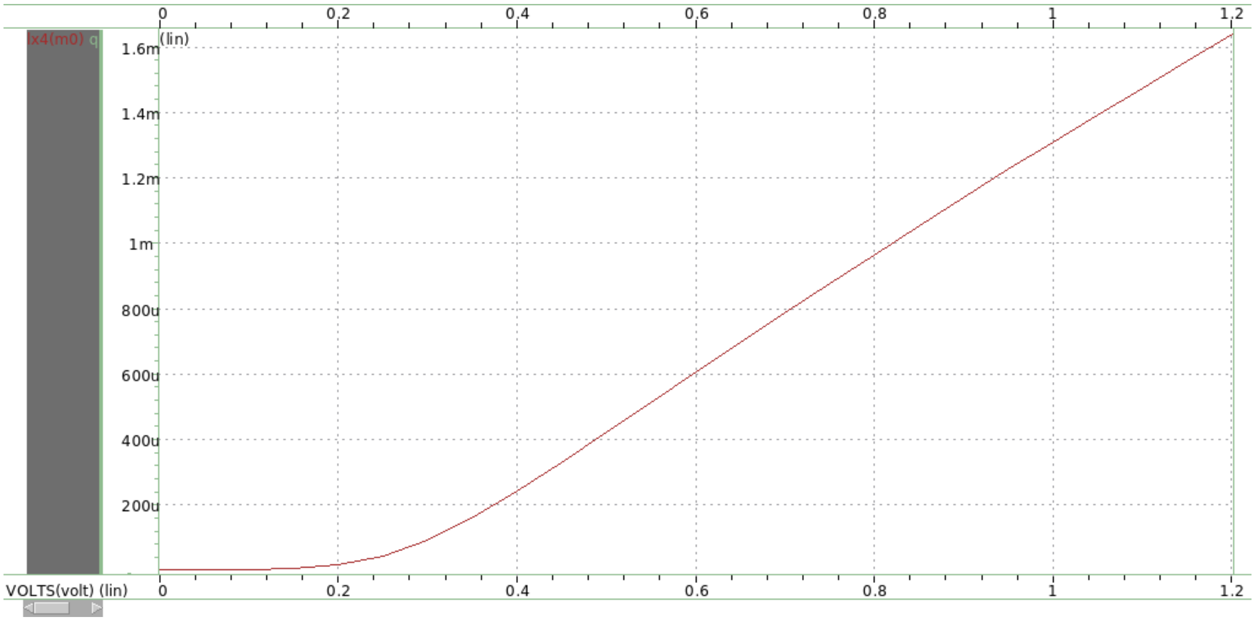
Q1A



Q1B

From Q1A, the V_{th} voltage is approximated at 0.2V.

Figure 2.1: the transistor operates in the linear and saturation region. Saturation occurs at

$V_{DS} \geq V_{GS} - V_{th} = 0.6 - 0.2 = 0.4$

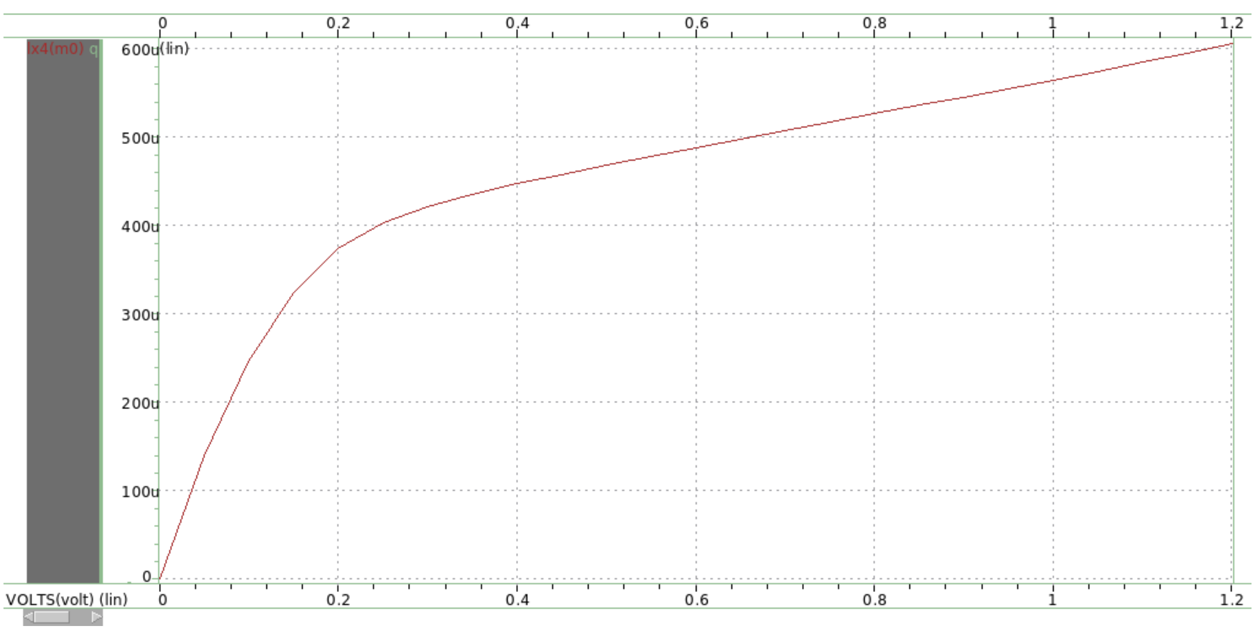
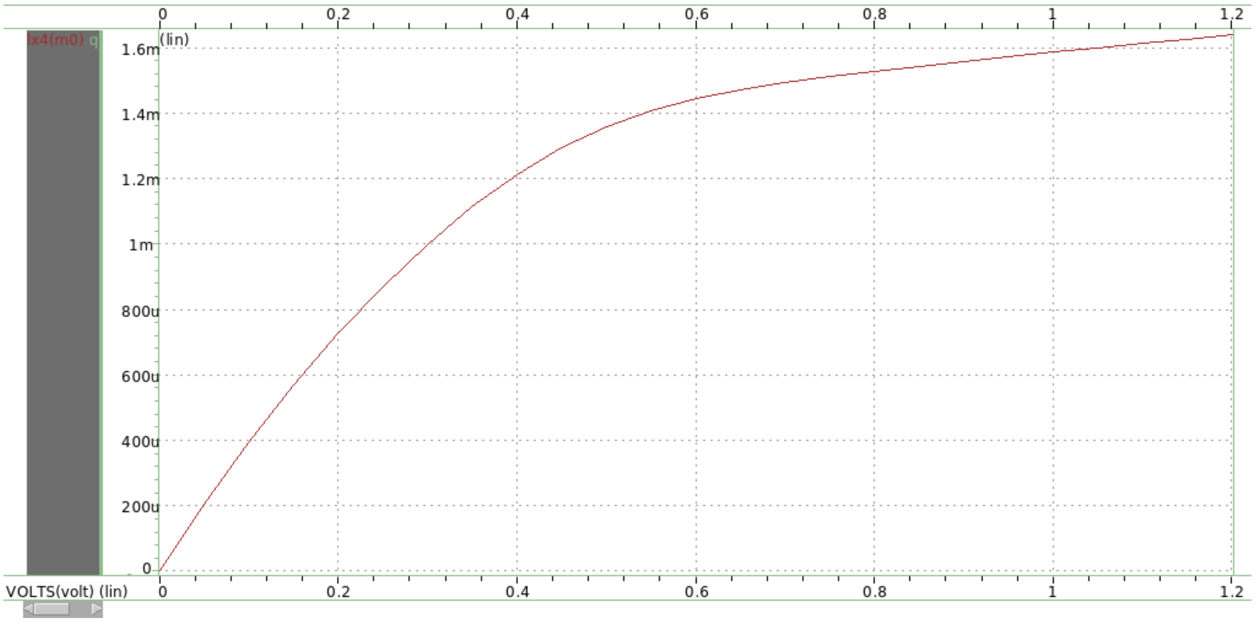
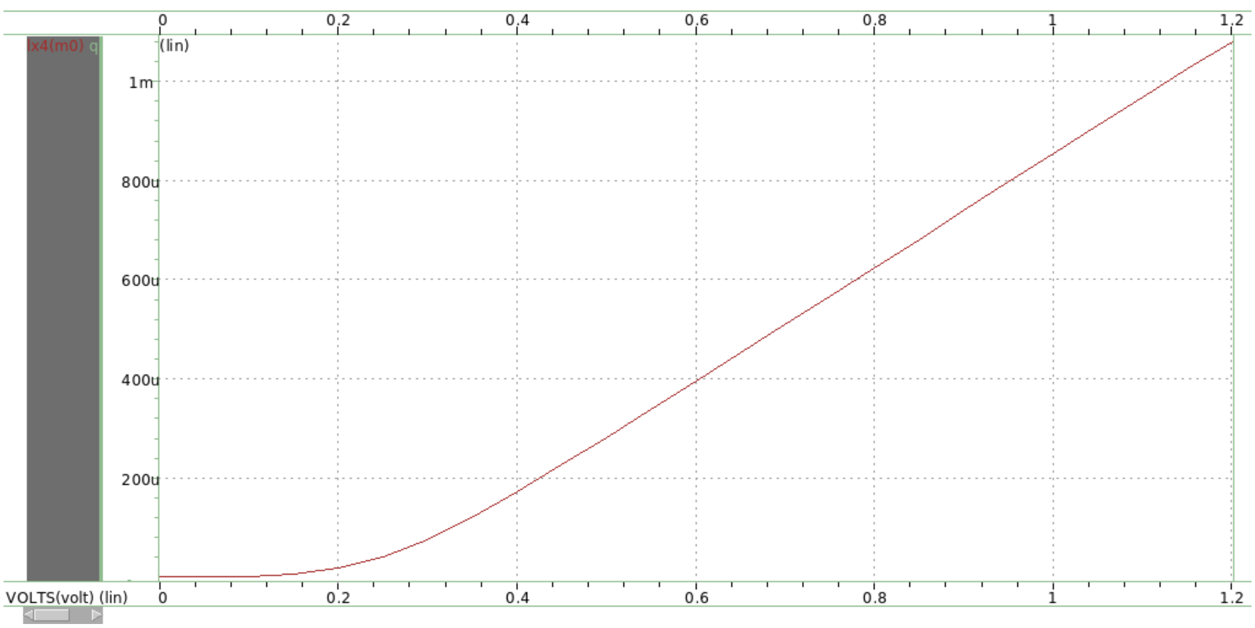


Figure 2.2: the transistor operates in the linear and saturation region. It enters saturation when

$V_{DS} \geq V_{GS} - V_{th} = 1.2 - 0.2 = 1.0\text{V}$



Q1C



Q1D

Q2A

Figure 5.1

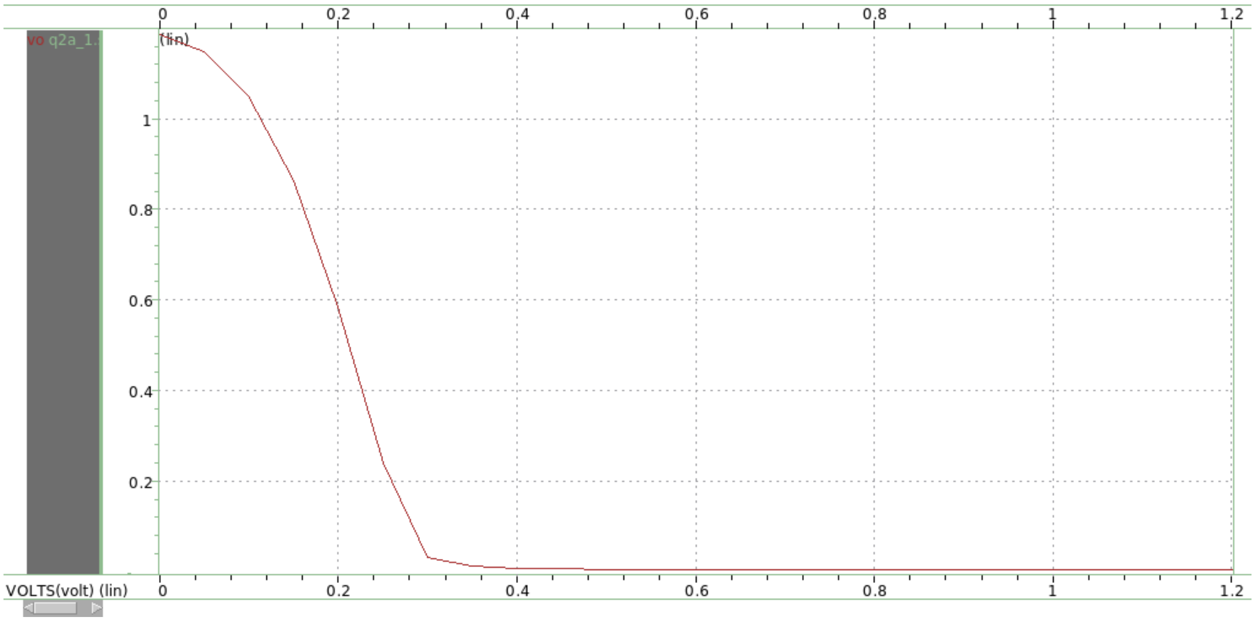
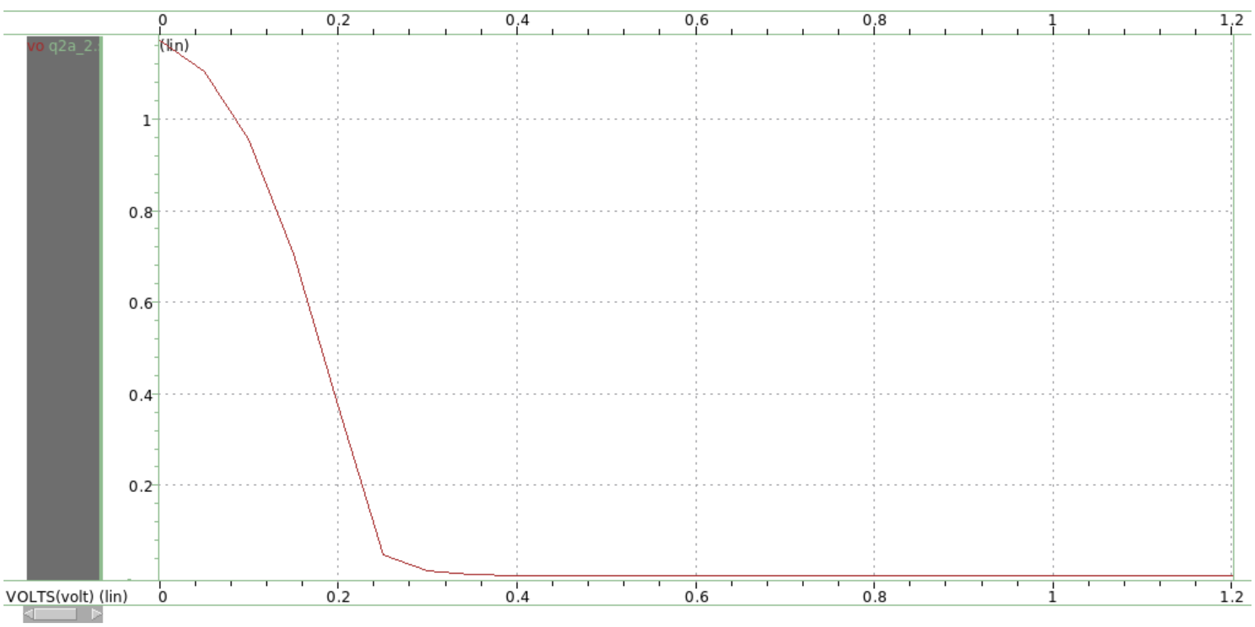
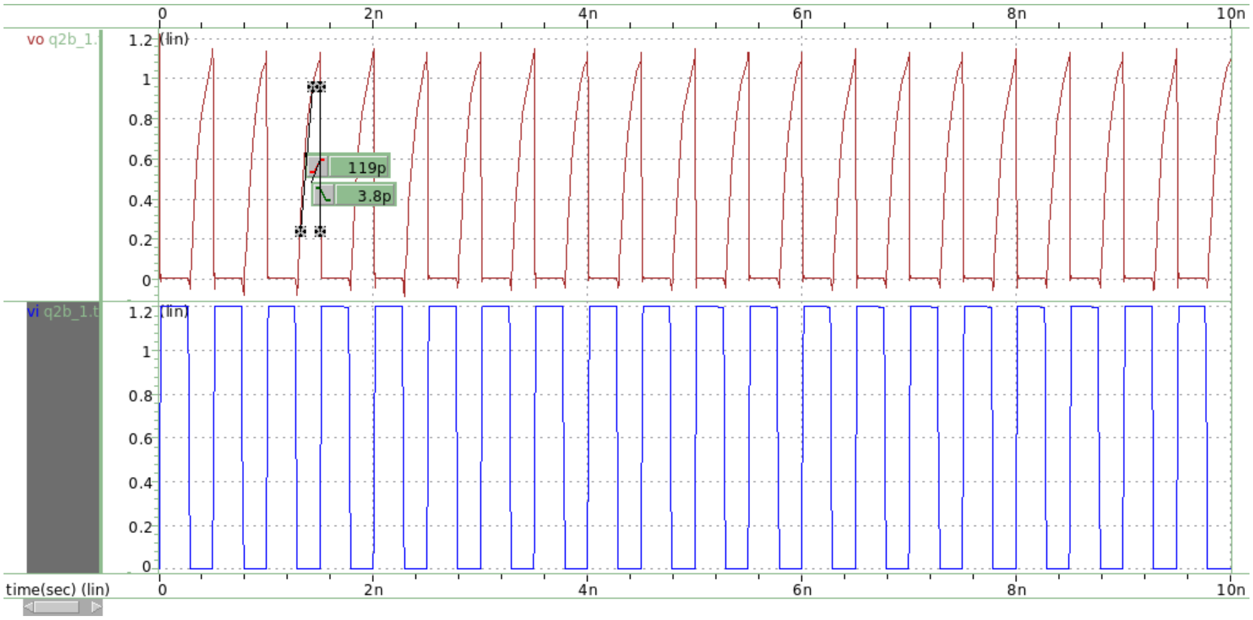


Figure 5.2

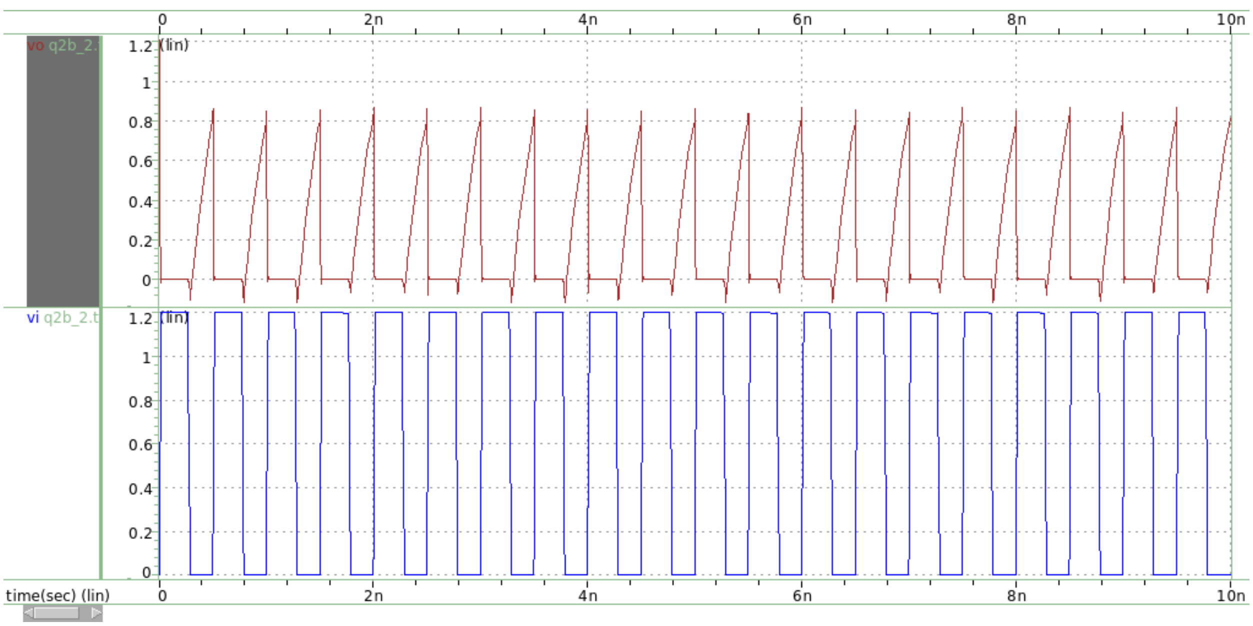


Q2B

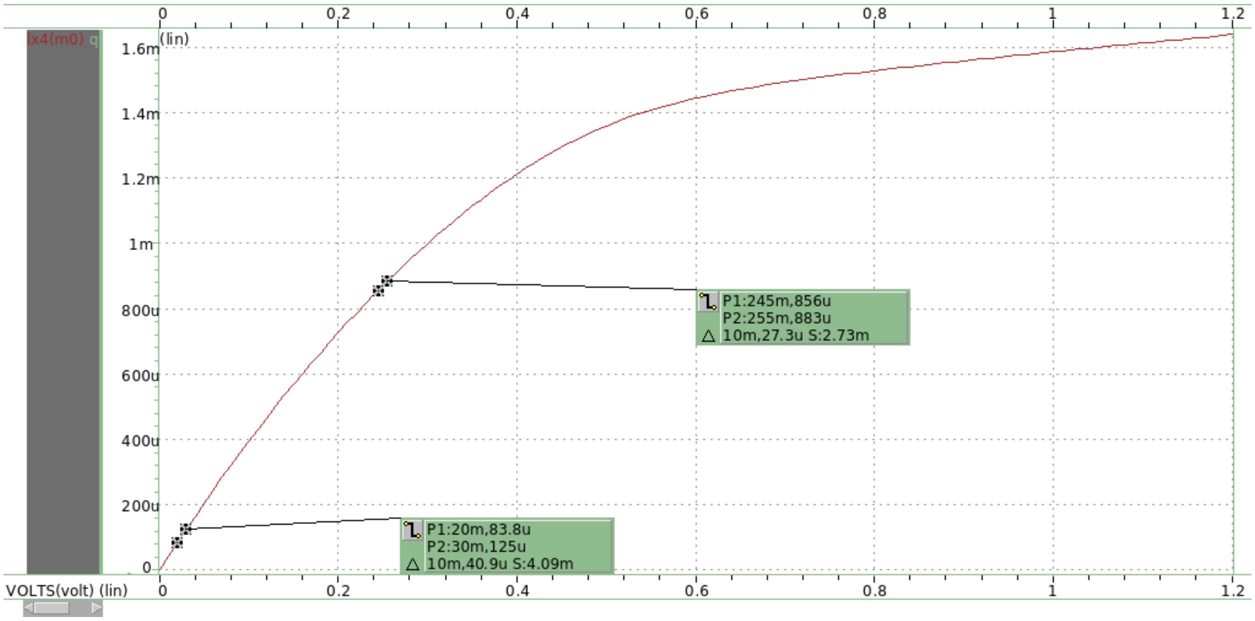
R0=100K



R0=200K

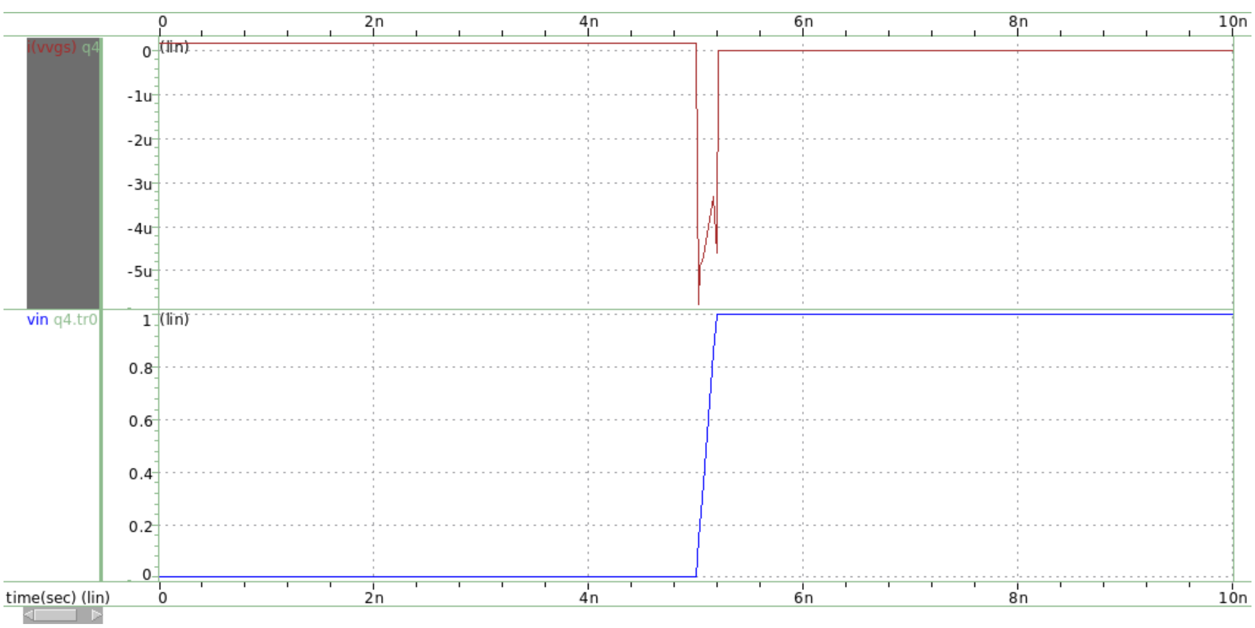


Q3



lx4(m0)
(lin)
P1:245m,856u
P2:255m,883u
△ 10m,27.3u S:2.73m
P1:20m,83.8u
P2:30m,125u
△ 10m,40.9u S:4.09m
VOLTS(volt) (lin)

Q4



i(vvgs)
(lin)
vin
(lin)
time(sec) (lin)

Q5

A

Given, $V_{th} = 0.2$ from graphical inspection then we can solve a system of equations for β and n.

$$I = 0.5\beta(V_{GS} - V_{th})^n$$

$$421E - 6 = 0.5\beta(0.5 - 0.2)^n$$

$$965E - 6 = 0.5\beta(0.8 - 0.2)^n$$

Then $\beta = 0.00356$ and $n = 1.197$

B

Given, $V_{th} = 0.2$ from graphical inspection then we can solve a system of equations for β and n.

$$I = 0.5\beta(V_{GS} - V_{th})^n$$

$$282E - 6 = 0.5\beta(0.5 - 0.2)^n$$

$$624E - 6 = 0.5\beta(0.8 - 0.2)^n$$

Then $\beta = 0.00224$ and $n = 1.146$

C

$$\frac{\beta_N}{\beta_P} = \frac{0.00356}{0.00224} = 1.59$$

D