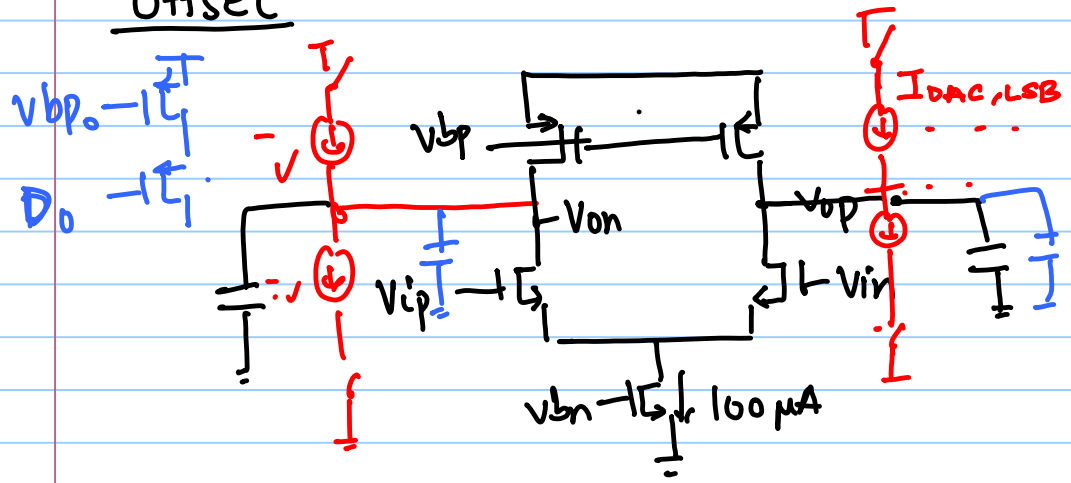
Note Title

Lecture # 41

10-04-2019

Offset



$$\frac{V_{op}-V_{on}}{V_{ip}-V_{in}} = \frac{A_{DC}}{1+s/\omega_p}$$

$\sigma_{os,out} = 5\,mV$

$|V_{out,diff}| < 3\sigma = 15\,mV$

$\sigma_{os,in} = \frac{5mV}{20}$

$\pm 15\,mV \rightarrow \frac{30mV}{2^5}$

$\approx 2\,mV$

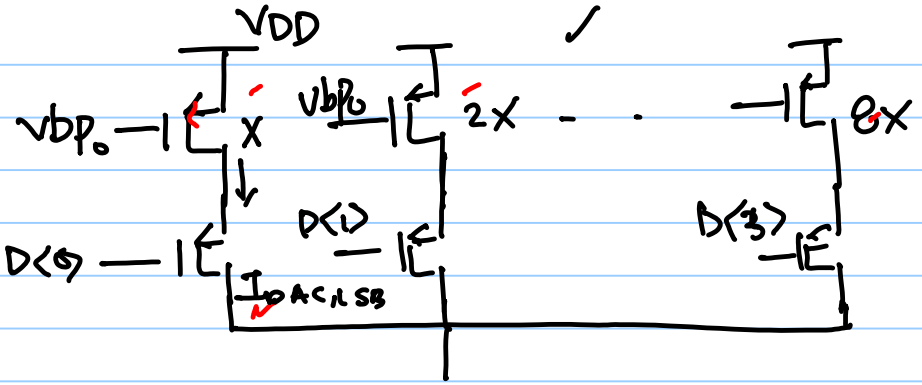
$A_{DC} = 20\ V/V$

$\frac{g_m}{I_d} = \frac{2}{V_{OV}} = \frac{2}{0.2} = 10/V$

$g_m = 50\,\mu A \times 10 = 500\,\mu A/V$

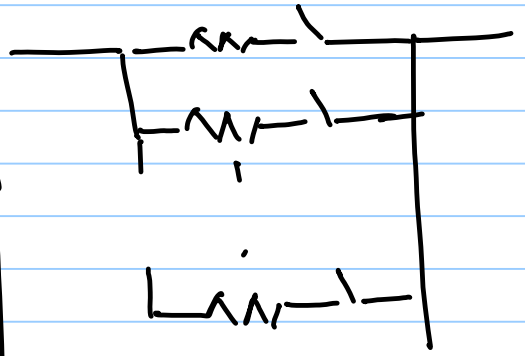
$r_{ds} = \frac{20}{0.5\times10^{-3}} = \frac{40000}{0.5}$

$i = \frac{15mV}{40K} = \frac{15\times10^{-3}}{40\times10^{3}} = \frac{3}{8}\,\mu A$

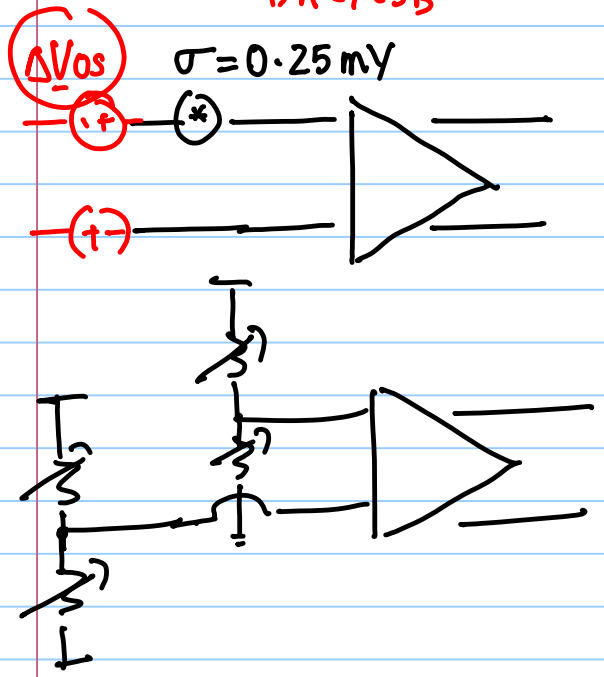


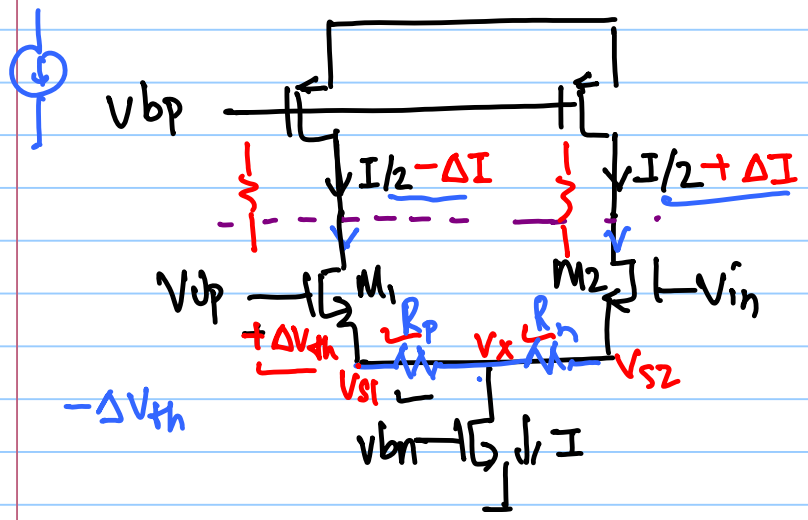
$$\frac{32\,mV}{2^5} = 1mV$$

$$\frac{3.2mV}{2^5} = 0.1mV$$

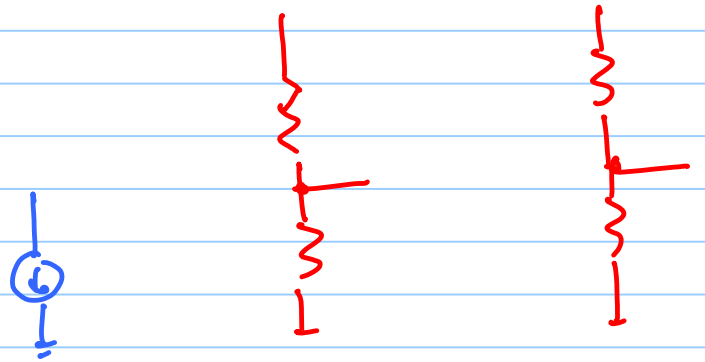


$I_{DAC,LSB}$





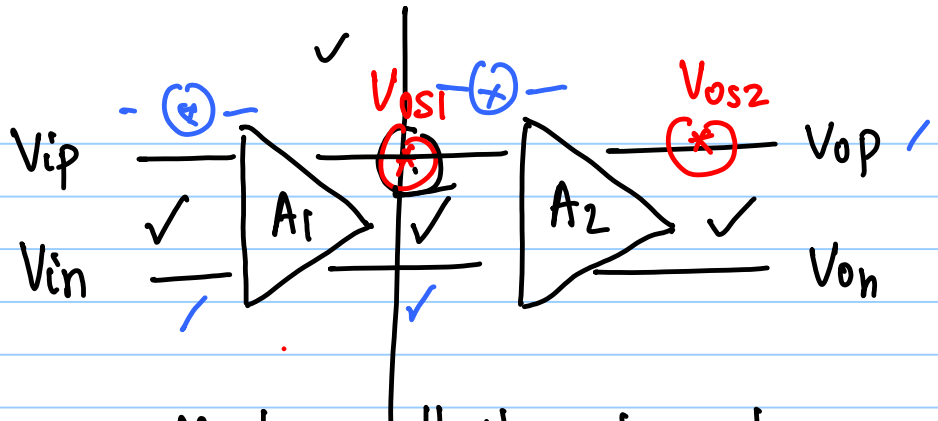
$V_{s1} < V_{s2}$



$$I_1 = \frac{KW}{2L}\left(V_{cm} - \left(V_x + \frac{I}{2}R_p\right) - \left(V_{tn} + \Delta V_{th}\right)\right)^2$$

$$I_2 = \frac{KW}{2L}\left(V_{cm} - \left(V_x + \frac{I}{2}R_n\right) - V_{tn}\right)^2 = I_1$$

$$\Delta R = \frac{\Delta I}{(I/2)\cdot g_m}$$

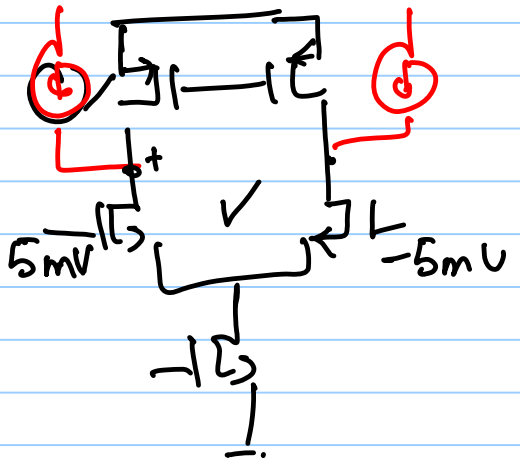


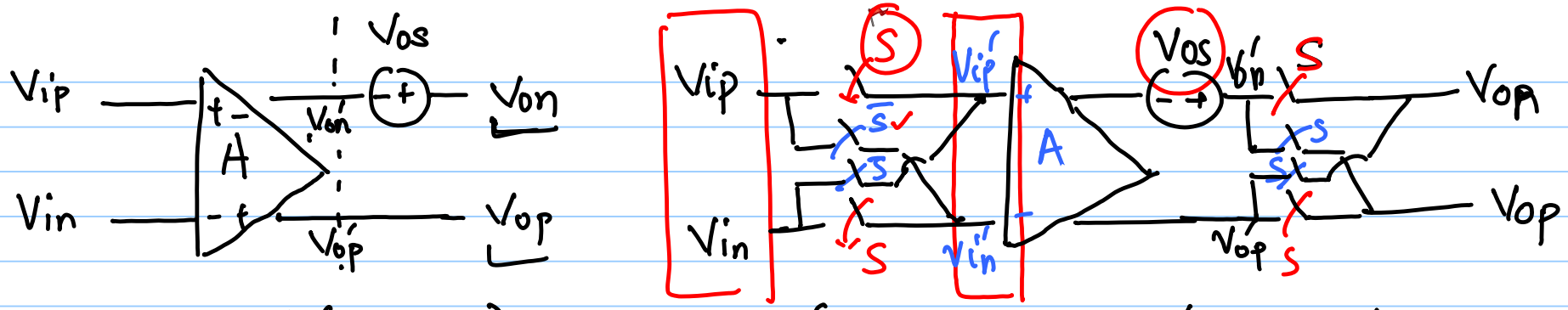
$$\sigma^2_{OS,out} = \sigma^2_{OS2,out} + A_2^2 \sigma^2_{OS1,out}$$

1. Offset cancellation in each amp.

2. Offset compensation only at one nodes.

$$10\,mV \xrightarrow{A_2} 200\,mV + 0 \longrightarrow 200mV$$



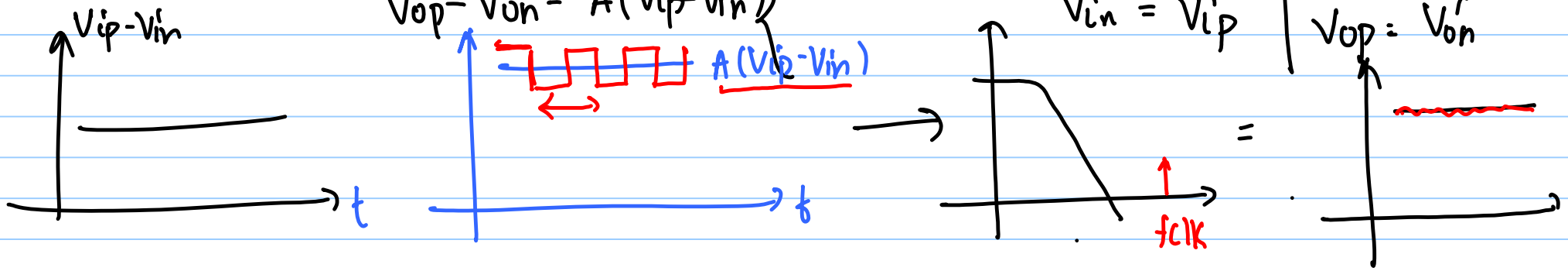


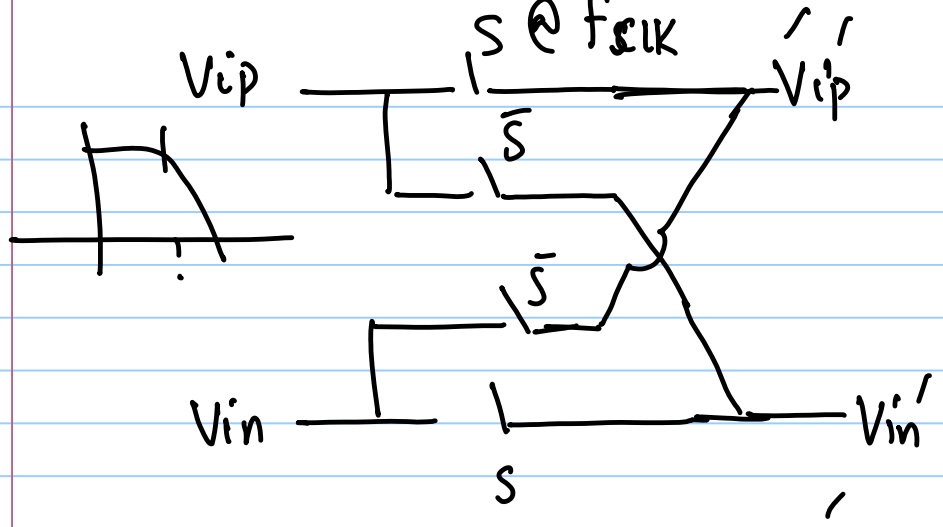
$$V_{op} - V_{on} = A(V_{ip} - V_{in}) - V_{os}$$

$$V_{op} - V_{on} = A(V_{ip} - V_{in})$$

S is high: $V_{ip}' = V_{ip}$, $V_{in}' = V_{in}$, $V_{on} = V_{on}'$, $V_{op} = V_{op}'$

S is low: $V_{ip}' = V_{in}$, $V_{in}' = V_{ip}$, $V_{on} = V_{op}'$, $V_{op} = V_{on}'$




S @ fCLK
Vip
Vip'
S̄
S̄
Vin
Vin'
S