Feed Forward line compensation

$LG \propto \frac{V_{in}}{V_m}$ for opamp-RC compensator

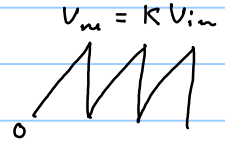
$LG \propto \beta \frac{V_{in}}{V_m}$ for g_m-C compensator.

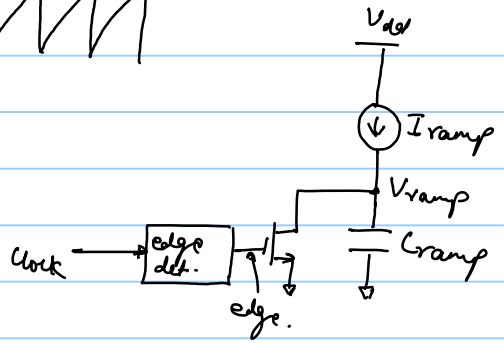
V_{in} → line voltage

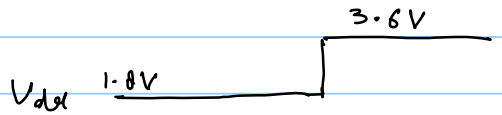
if $V_m \propto V_{in}$

then

$LG \propto \beta$ for G_m-C compensator.







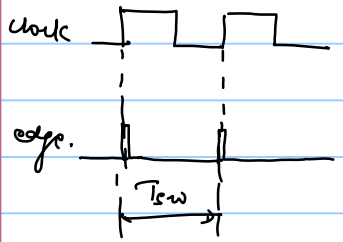
$V_o = D \cdot V_{in}$

$V_{in} = 1.8V$, $V_o = 0.9V$

$D = 0.5$

for $V_{in} = 3.6$,

$D = 0.25$



$$V_m = \frac{I_{ramp} \times T_{sw}}{C}$$

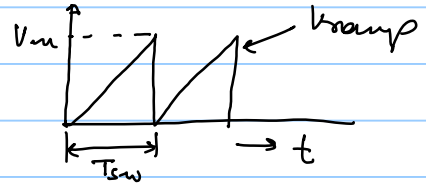
$$I_{ramp} = \frac{V_{in}}{R}$$

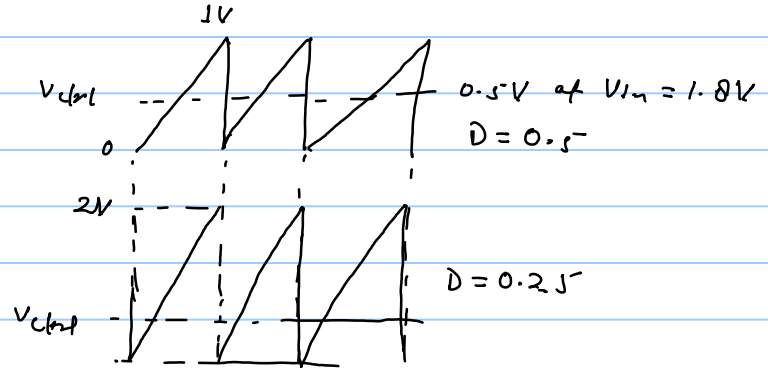
$$V_m = \frac{V_{in} \times T_{sw}}{R C}$$

T_{sw}, R & C → constant

$V_m \propto V_{in}$

Improves line transient as well.



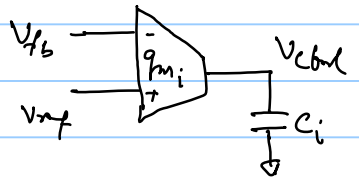


For G_m-C compensation

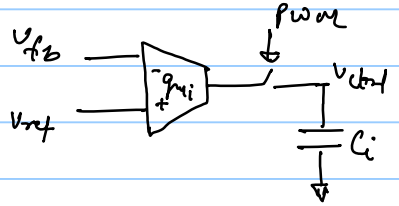
$$LG \propto \frac{V_{in}}{V_m}\beta = \frac{V_{in}}{V_m} \times \frac{V_{ref}}{V_o} = \frac{V_{ref}}{V_m}\left(\frac{1}{D}\right)$$

if V_{ref} & V_m are constant

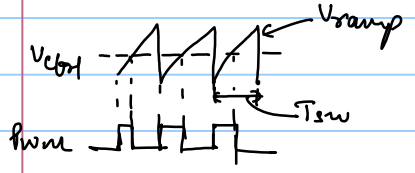
then $LG \propto \frac{1}{D}$

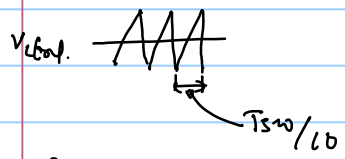


$$k_i = \frac{g_{mi}}{C_i}$$

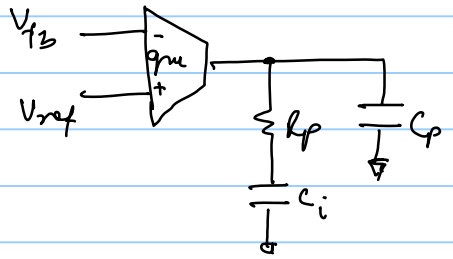


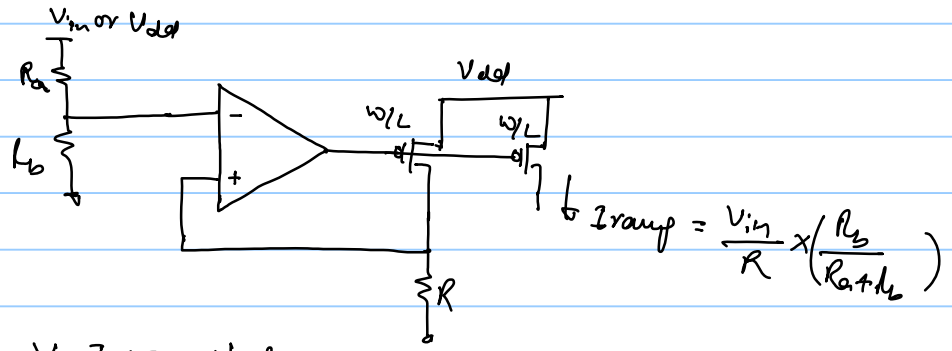
$$k_i = \frac{D \cdot g_{mi}}{C_i}$$





PWM at 10x frequency with same D.





$$I_{ramp} = \frac{V_{in}}{R} \times \left(\frac{R_b}{R_a + R_b} \right)$$

V-I converter.