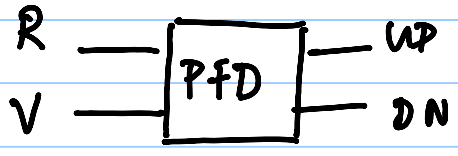
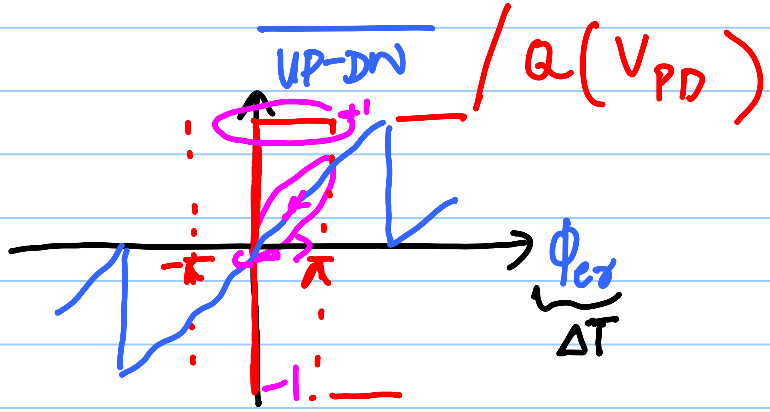
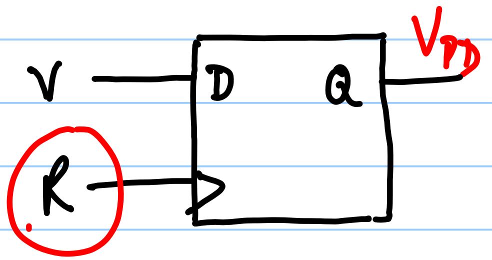
Note Title 06-10-2020

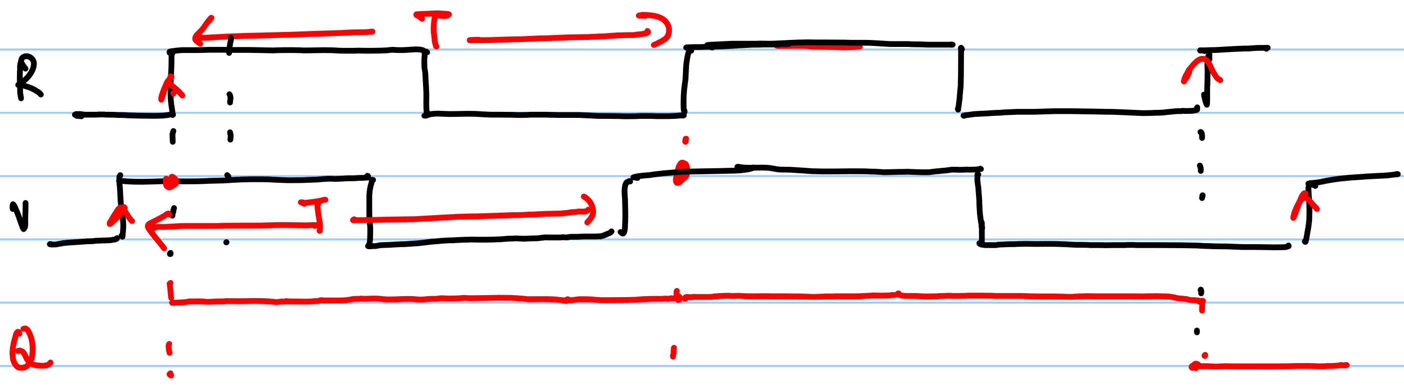
Lecture #14

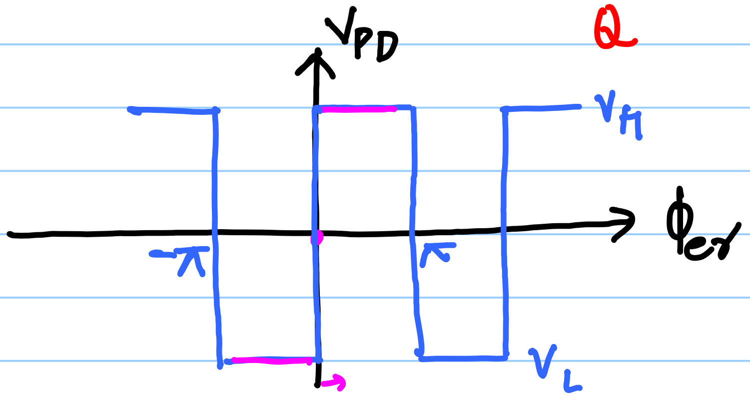
D-Flip flop PD





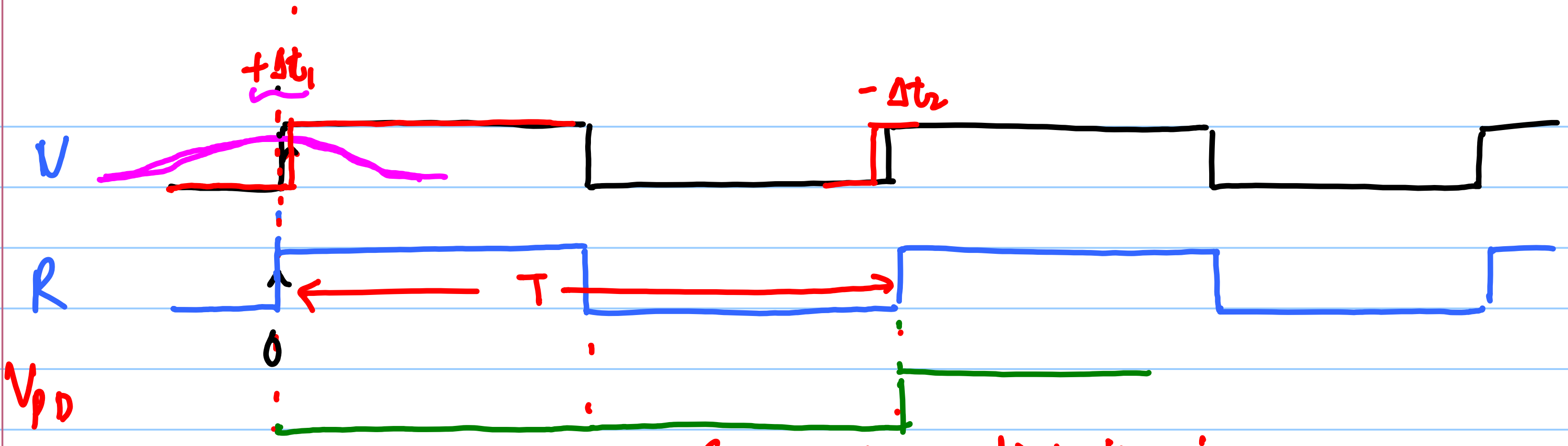






Gain of PD, $K_{PD} = \infty = \dfrac{V_H - V_L}{\phi_{er}(0)}$

$\phi_{er} = 0$, $V_{PD} = 0$

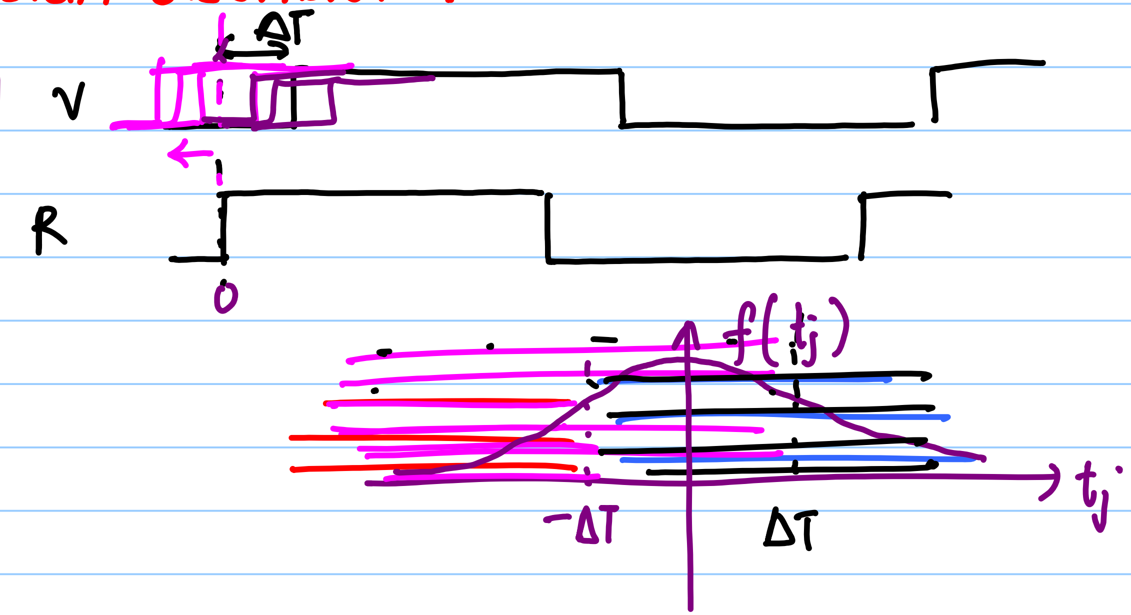


$\Delta t_1, \Delta t_2, \Delta t_3, \ldots$: Gaussian distribution.

$\Delta t_1 \sim N(0, \sigma)$ ✓

$\Delta t_2 \sim N(0, \sigma)$

$$\overline{V_{PD}(\Delta T)} = V_H P(\Delta T + t_j \leq 0) + V_L P(\Delta T + t_j > 0)$$



$V_H = -V_L = A$

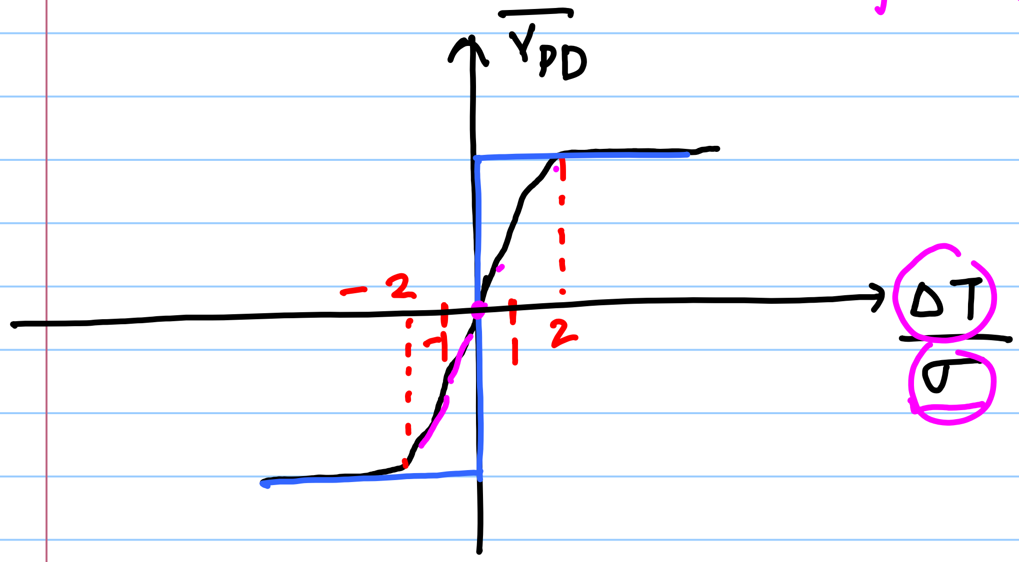
$$\overline{V_{PD}(\Delta T)} = A\, P(t_j \leq -\Delta T) - A\, P(t_j > -\Delta T)$$ ✓

$$= A\, P(t_j \leq -\Delta T) - A\, P(t_j < \Delta T)$$

$$= A\, P(t_j \geq \Delta T) - A\, P(t_j < \Delta T).$$

$$= A\left(1 - P(t_j \le \Delta T)\right) - A\,P(t_j < \Delta T)$$

$$= A\left(1 - 2P(t_j \le \Delta T)\right)$$



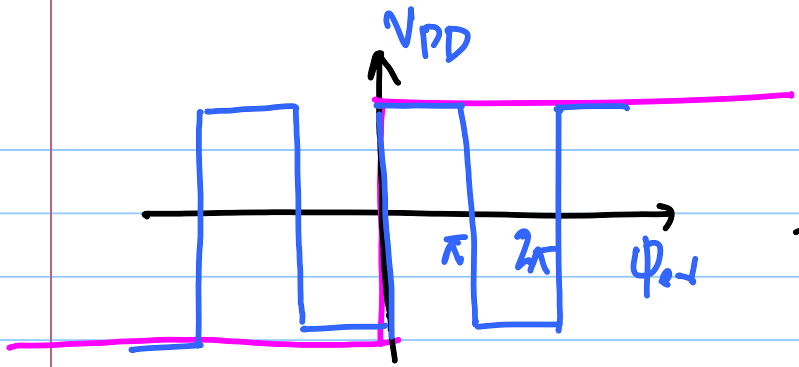
$$\boxed{K_{PD} = \frac{\partial \overline{V_{PD}}}{d\,\Delta T} =}$$

$$K_{PD} = \frac{\partial \overline{V_{PD}}}{d\,\phi_{er}} = \frac{\partial \overline{V_{PD}}}{d(\Delta T)} \frac{d(\Delta T)}{d(\phi_{er})}$$

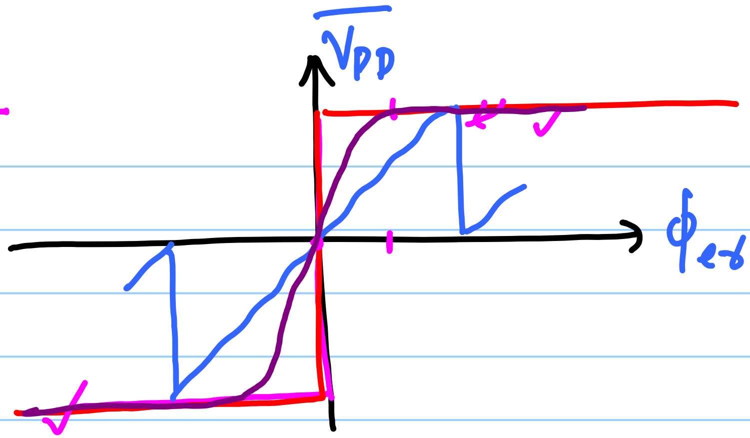
$$= \frac{T}{2\pi} \frac{d(\overline{V_{PD}})}{d(\Delta T)}$$

$$\phi_{er} = 2\pi \cdot \frac{\Delta T}{T}$$

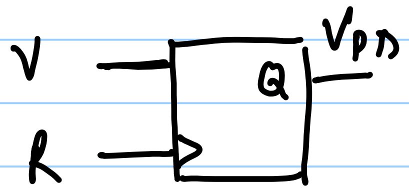
$$\frac{d(\Delta T)}{d(\phi_{er})} = \frac{T}{2\pi}$$



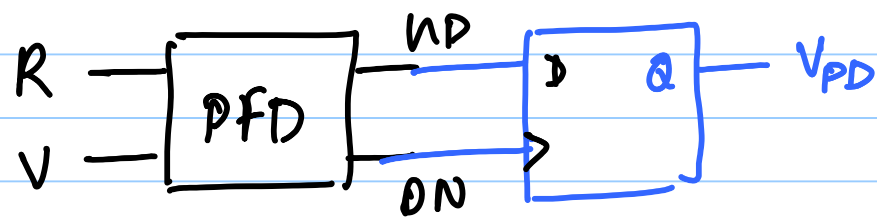
VPD
π
2π
φed



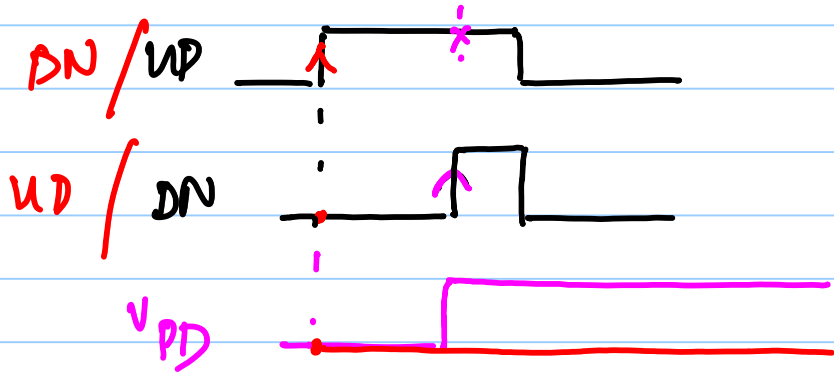
VPD
φed



V
R
Q
VPD



R
V
PFD
UP
DN
D
Q
VPD



DN / UP
UD / DN
VPD