



$$Q(x) = C_{ox} [V_{eff} - V(x)] \quad v = \text{speed} = \mu_n E = \mu_n \frac{dV}{dx}$$

$$I_D = W \cdot Q(x) \cdot v = \underbrace{\mu_n C_{ox} W}_l [V_{eff} - V(x)] \frac{dV}{dx}$$

$$I_D dx = l [V_{eff} - V(x)] dV$$

$$I_D \int_0^L dx = l \int_0^{V_{DS}} [V_{eff} - V(x)] dV$$

$$I_D L = \mu_n C_{ox} W \left[V_{eff} V_{DS} - \frac{V_{DS}^2}{2} \right]$$

$$@ V_{DS} = V_{eff} \Rightarrow \underline{\underline{I_D = \frac{1}{2} \mu_n C_{ox} \frac{W}{L} V_{eff}^2}}$$