FORWARD BIAS (FB)

* Electrostatic potential barrier at the junction is lowered by $V_F$ from $V_0$
  \[ V_F \text{ is in opposite polarity as } V_0 \]

* E Field goes down \( \Rightarrow \) Applied $E$ is in opposite direction as built-in $E$

* Diffusion current increases \( \Rightarrow \) Injection of carriers (majority) in the P and N regions. Since the barrier is lowered, majority carriers have sufficient energy to cause an increase in current!

* Drift current remains the same \( \Rightarrow \) It depends only on EHP generation of minority carriers in the majority regions
* SOME USEFUL APPLICATION WHERE EHP GENERATION IS INCREASED, LEADING TO DRIFT CURRENT INCREASE, OTHER THAN THERMAL EXCITATION IS OPTICAL EXCITATION \( \rightarrow \) PHOTODiode

\[
W = \left[ \frac{2 \, \text{cGx} \, (V_0 - V_F)}{q} \left( \frac{(N_{\text{A}}^+)_{\text{eff}} + (N_{\text{D}}^+)^{\text{eff}}}{(N_{\text{A}}^-)^{\text{eff}} \, (N_{\text{D}}^+)^{\text{eff}}} \right) \right]^{1/2}
\]
**Reverse Bias**

* Applied E Field is now in the direction of Internal E Field \( \Rightarrow \) Net E Field increases

* \( \mu \) increases \( \Rightarrow \) Large Barrier

* Majority Carriers don't have the energy to pass the barrier \( \Rightarrow \) Diffusion current decreases

* Drift current remains the same \( \Rightarrow \) It depends on EHP generation of minority carriers due to thermal excitation!