







# Charge Coupling

At some low  $|V_r|$ , depletion region expand to  $w_D \approx w_N \approx w_P$

$\frac{\delta E}{E} \approx \frac{\alpha E}{E} \rightarrow \alpha E \approx \delta E$   
 $n_A \approx n_D$   
 $0 < \alpha < 1$

$E^2 = \bar{E}_x^2 + \bar{E}_y^2$

Previously "Ideal"  $R_{on,sp} \propto \frac{V_{bi}^2}{\mu n E_c^2}$

$\alpha E_c = \frac{\delta^{n_D} w_D}{\epsilon} \rightarrow \delta^{n_D} = \frac{\alpha E_c \epsilon}{w_D}$

$R_{on,sp} = \frac{V_{bi} w_N}{\mu n \alpha E_c^2}$  @  $w_D = w_N = w_P$

T. Fujihira "Theory of Semiconductor Superjunction Devices"