

$$\sqrt{\frac{I_{DQ}}{\beta_p}} = k = \frac{V_{DD} - |V_{th,p}| - V_0}{V_0 - V_{th,n}}$$

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Example: say choose $V_0 = 2V$
where $V_{th,n} = 0.5$, $|V_{th,p}| = -0.8$

$$V_{DD} = 5V$$

$$k = \frac{5 - 0.8 - 2}{2 - 0.5} = \frac{2.2}{3/2}$$

$$= \frac{4.4}{3} = 1.46$$

$$\beta_p = \beta_n / k^2 = \frac{\beta_n}{(1.46)^2}$$

$$\frac{K_{p,p}}{2} \cdot \frac{W_p}{L_p} = \frac{K_{p,n}}{2} \cdot \frac{W_n}{L_n} \cdot \frac{1}{(1.46)^2}$$

$$W_p = \frac{K_{p,n}}{K_{p,p}} \cdot \frac{L_p}{L_n} \cdot W_n (0.47)$$

$$\times (0.47 \approx \frac{1}{2})$$