$$I_{d(y)} = WQ_{ch(y)}\mu_{ne(y)}\frac{dV_{F(y)}}{dy} \tag{3.3.1}$$

where the parameter $u_{ne}(y)$ can be written as

$$\mu_{ne(y)} = \frac{\mu_{eff}}{1+\frac{E_y}{E_{sat}}} \tag{3.3.2}$$

Substituting Eq. (3.3.2) in Eq. (3.3.1) we get

$$I_{d(y)} = WQ_{chso}(1-\frac{V_{F(y)}}{V_b})\frac{\mu_{eff}}{1+\frac{E_y}{E_{sat}}}\frac{dV_{F(y)}}{dy} \tag{3.3.3}$$

Eq. (3.3.3) resembles the equation used to model drain current in the strong inversion regime. However, it can now be used to describe the current characteristics in the subthreshold regime when V_{ds} is very small ($V_{ds}<2v_t$). Eq. (3.3.3) can now be integrated from the source to drain to get the expression for linear drain current in the channel. This expression is valid from the subthreshold regime to the strong inversion regime

$$I_{ds0} = \frac{W\mu_{eff}Q_{chs0}V_{ds}\left(1-\frac{V_{ds}}{2V_b}\right)}{L\left(1+\frac{V_{ds}}{E_{sat}L}\right)} \tag{3.3.4}$$