The parameter λ is introduced to account for non-saturation effects. Parameters A_1 and A_2 can be extracted.

3.5 Unified Saturation Current Expression

A unified expression for the saturation current from the subthreshold to the strong inversion regime can be formulated by introducing the V_{gsteff} function into Eq. (2.6.15). The resulting equations are the following

$$I_{ds} = \frac{I_{dso(Vdsat)}}{1 + \frac{R_{ds} I_{dso(Vdsat)}}{V_{dsat}}} \left(1 + \frac{V_{ds} - V_{dsat}}{V_A}\right)\left(1 + \frac{V_{ds} - V_{dsat}}{V_{ASCBE}}\right) \tag{3.5.1}$$

where

$$V_A = V_{Asat} + (1 + \frac{P_{vag} V_{gsteff}}{E_{sat} L_{eff}})(\frac{1}{V_{ACLM}} + \frac{1}{V_{ADIBLC}})^{-1} \tag{3.5.2}$$

$$V_{Asat} = \frac{E_{sat} L_{eff} + V_{dsat} + 2 R_{DS} v_{sat} C_{ox} W_{eff} V_{gsteff} [1 - \frac{A_{bulk} V_{dsat}}{2(V_{gsteff} + 2v_t)}]}{2 / \lambda - 1 + R_{DS} v_{sat} C_{ox} W_{eff} A_{bulk}} \tag{3.5.3}$$

$$V_{ACLM} = \frac{A_{bulk} E_{sat} L_{eff} + V_{gsteff}}{P_{CLM} A_{bulk} E_{sat}\ litl} (V_{ds} - V_{dsat}) \tag{3.5.4}$$