Derivation of f_{SDM} :

$$i_{pv} = f_{SDM}(x_1) = N_p \left(i_{ph}(S,\Delta T) - i_d(x_1) - \frac{x_1}{N_s R_h} \right)$$

with
$$i_d(x_1) = i_s(S,\Delta T)\left(e^{\frac{x_1}{N_s V_{T,STC} A_n}} - 1 \right)$$

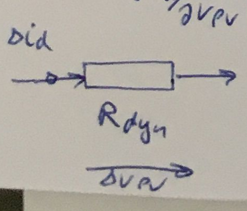
$$\frac{\partial i_{pv}}{\partial x_1} = - N_p \frac{\partial i_d(x_1)}{\partial x_1} - \frac{N_p}{N_s R_h}$$

$$\frac{\partial i_d(x_1)}{\partial x_1} = i_s(S,\Delta T) \frac{1}{N_s V_{T,STC} A_n} e^{\frac{x_1}{N_s V_{T,STC} A_n}}$$

$$\leadsto \boxed{\frac{\partial f_{SDM}(x_1)}{\partial x_1} = \underbrace{- \frac{N_p}{N_s V_{T,STC} A_n} i_s(S,\Delta T)\, e^{\frac{x_1}{N_s V_{T,STC} A_n}}}_{\text{equal to (6.12), Xiao}} - \frac{N_p}{N_s R_h}} \quad \text{(4)}$$

Interpretation : $\frac{\partial i_d(x_1)}{\partial x_1}$ can be interpreted as an dynamic inverse resistance

$1/\partial i_d/\partial v_{pv}|_c$



$$\frac{1}{R_{dyn}} = \frac{\partial i_d(x_1)}{\partial x_1} \qquad x_1 = V_{pv}$$