

**5: Standard MOSFET Models: Levels 50 to 64**  
Level 61 RPI a-Si TFT Model

$$n_{sb} = n_{so} \left( \frac{t_m}{TOX} \frac{V_{gfbe} EPSI}{V_0 EPS} \right)^{\frac{2 \cdot V_0}{V_e}}$$

$$n_{so} = N_c t_m \frac{V_e}{V_0} \exp\left(-\frac{DEF0}{V_{th}}\right) \quad N_c = 3.0 \cdot 10^{25} m^{-3}$$

$$V_e = \frac{2 \cdot V_0 \cdot V_{tho}}{2 \cdot V_0 - V_{th}} \quad t_m = \sqrt{\frac{EPS}{2q \cdot GMIN}}$$

$$V_{gte} = \frac{VMIN}{2} \left[ 1 + \frac{V_{gt}}{VMIN} + \sqrt{DELTA^2 + \left( \frac{V_{gt}}{VMIN} - 1 \right)^2} \right]$$

$$V_{gt} = V_{gs} - V_T$$

$$V_{gfbe} = \frac{VMIN}{2} \left[ 1 + \frac{V_{gfb}}{VMIN} + \sqrt{DELTA^2 + \left( \frac{V_{gfb}}{VMIN} - 1 \right)^2} \right]$$

$$V_{gfb} = V_{gs} - VFB \quad I_{leakage} = I_{hl} + I_{min}$$

$$I_{hl} = IOL \left[ \exp\left(\frac{V_{ds}}{VDSL}\right) - 1 \right] \exp\left(-\frac{V_{gs}}{VGSL}\right) \exp\left[\frac{EL}{q} \left( \frac{1}{V_{tho}} - \frac{1}{V_{th}} \right) \right]$$

$$I_{min} = SIGMA0 \cdot V_{ds}$$

### Temperature Dependence

$$V_{tho} = k_B \cdot TNOM / q \quad V_{th} = k_B \cdot (TEMP) / q$$

$$V_{aat} = VAA \exp\left[\frac{EMU}{q \cdot GAMMA} \left( \frac{1}{V_{th}} - \frac{1}{V_{tho}} \right) \right]$$

$$V_T = VTO + KVT(TEMP - TNOM)$$

$$\alpha_{sat} = ALPHASAT + KASAT(TEMP - TNOM)$$