

Supplementary Information

Fig. S1 (a) The pulse schematic for measuring the retention property. Sequential initial and set pulses were applied followed by a read pulse with $t_{\text{retention}}$. (b) $I_{\text{sw}}-V_{\text{BE}}$ and (c) $R-V_{\text{BE}}$ plots after $t_{\text{retention}} = 10, 100, \text{ and } 1000 \text{ s}$, which measured from C_{11} (MFSM).