

# Charge Storage and Reliability Characteristics of Nonvolatile Memory Capacitors with HfO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub>-Based Charge Trapping Layers

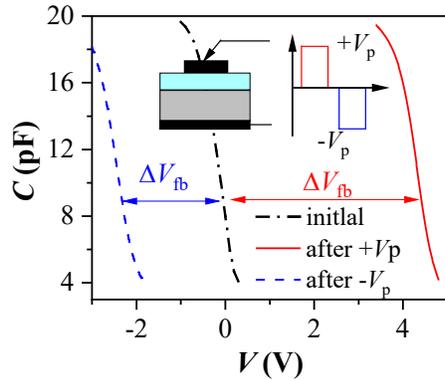
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**Figure S1.** An illustration of the memory window definition. The memory window,  $\Delta V$  is defined as the difference in the position of the measured C-V curves (measured flat band capacitance  $C_{fb}$ ) after applying consecutively positive voltage pulse (+Vp), under which negative charges are injected from Si and trapped in CTL, and negative voltage pulse (-Vp), under which positive charges are injected and trapped in CTL. The inset shows the measurement procedure.