

## **Abstract**

Theoretical and Experimental Investigation of Si Nanocrystal Memory Device  
with HfO<sub>2</sub> High-k Tunneling Dielectric

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This paper describes improved memory characteristics of the Si nanocrystal memory devices by replacing the traditional SiO<sub>2</sub> with HfO<sub>2</sub> high-k dielectrics for the first time. Thanks to the combination of a lower electron barrier height and a larger physical thickness of HfO<sub>2</sub> as compared with SiO<sub>2</sub>, the fabricated device shows excellent programming efficiency and data retention characteristic. The single-electron charging effect is clearly observed at room temperature. It also shows superior data endurance up to 10<sup>6</sup> write/erase cycles.