

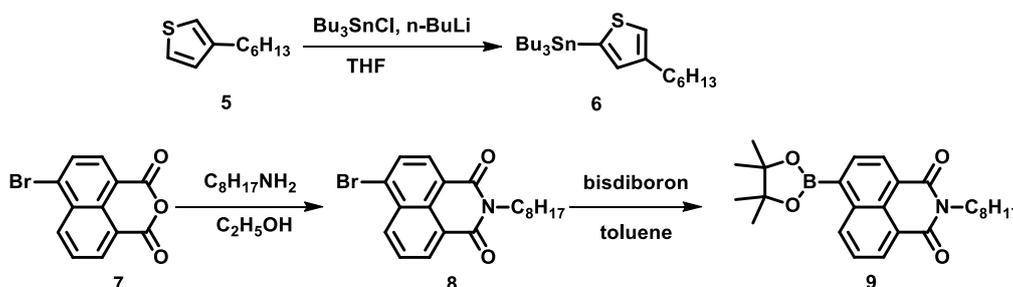
## Supplementary Information

### Novel ternary memory property achieved through rational introducing of end-capping naphthalimide acceptors

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#### 1 Experimental Section



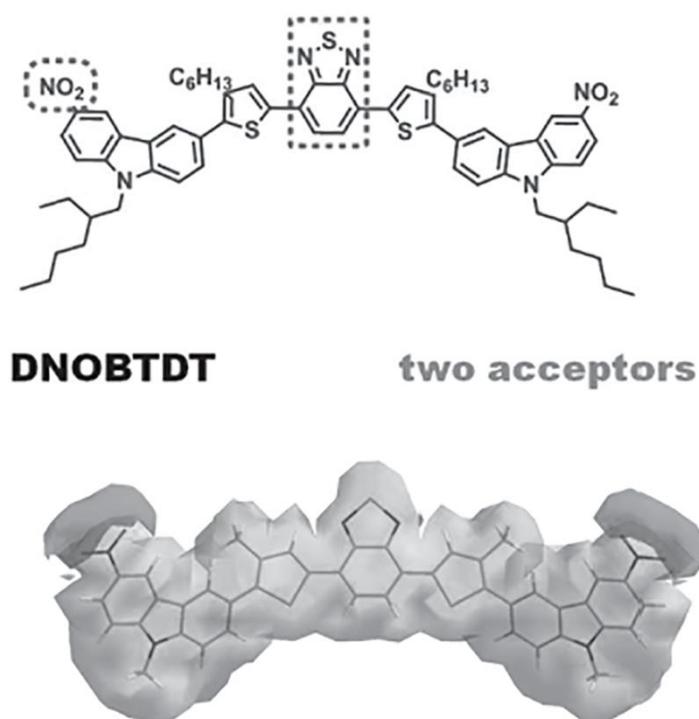
**Scheme S1.** Synthesis schemes and molecular structures of the intermediate compounds.

**Synthesis of Compound 6.**  $n\text{-BuLi}$  (22 mL, 1.5 M, 33 mmol) was added dropwise to a solution of 3-hexylthiophene (10.098 g, 60 mL) in anhydrous THF (50 mL) at  $-30^\circ\text{C}$ , and the mixture was stirred at this temperature under  $\text{N}_2$  for 2 h. Tributylchlorostannane (10.05 g, 30 mmol) was then added, and the mixture was stirred at  $-30^\circ\text{C}$  for 30 min. The mixture was poured into saturated aqueous sodium hydrogen carbonate, and the organic phase was separated and washed with saturated aqueous brine and then dried over an anhydrous sodium sulfate. The solvent was removed at a reduced pressure, and the residue was purified by column chromatography (neutral alumina, light petroleum) to obtain the product as colorless oil.

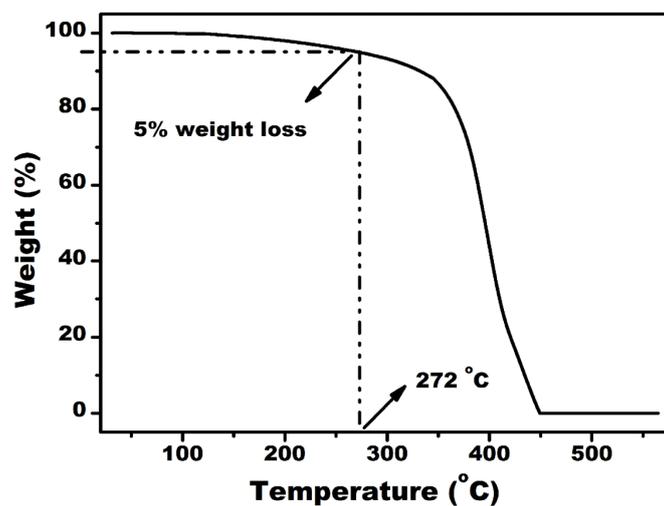
**Synthesis of Compound 9.** Compound 8 (388 mg, 1 mmol), bis(pinacolato)diboron (560 mg, 2.2 mmol) and anhydrous potassium acetate (588 mg, 6 mmol) were mixed in 20 mL of toluene. After a flow of  $\text{N}_2$  for approximately 20 min,  $\text{PdCl}_2(\text{dppf})$  (73 mg, 10 mol%) was added to the mixture. The reaction mixture was then heated at  $120^\circ\text{C}$  for 12 hours. After cooling to room temperature, the reaction mixture was separated into water and dichloromethane.

The aqueous phase was extracted 3 times with 20 mL of dichloromethane and then combined with the original dichloromethane phase. This dichloromethane solution was washed with brine twice and was then washed with water, followed by drying with Na<sub>2</sub>SO<sub>4</sub>. After rotary evaporation under reduced pressure to remove the excess solvent, the residue was purified through column chromatography on a silica gel with hexane/ethyl acetate (5:1, v/v) as the eluent. The product was obtained as a white powder (290 mg, 67%). <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>, δ): 9.12 (d, J = 7.5 Hz, 1H), 8.60 (m, 2H), 8.32 (d, J = 7.9 Hz, 1H), 7.79 (d, J = 7.9 Hz, 1H), 7.82 (t, J = 7.9 Hz, 1H), 4.18 (t, J = 7.1 Hz, 2H), 1.74 – 1.16 (m, 24H), 0.88 (t, J = 6.6 Hz, 3H).

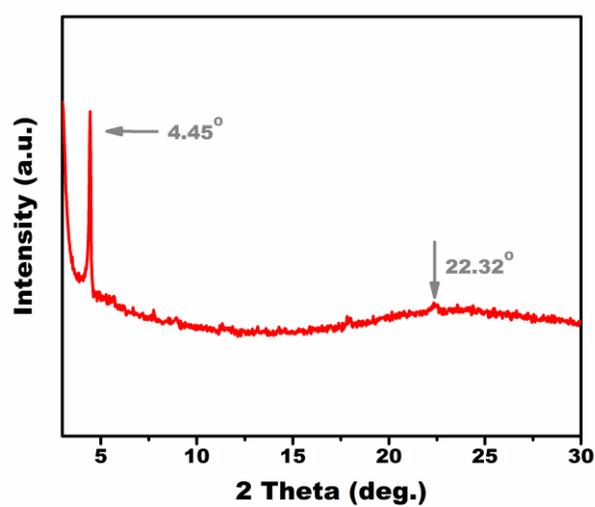
## 2 Figures



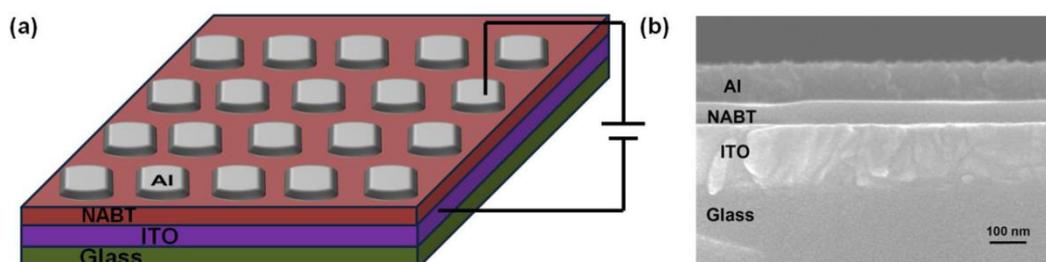
**Figure S1.** The molecular structure and the corresponding density functional theory (DFT) simulation for ESP of DNOBTDT.



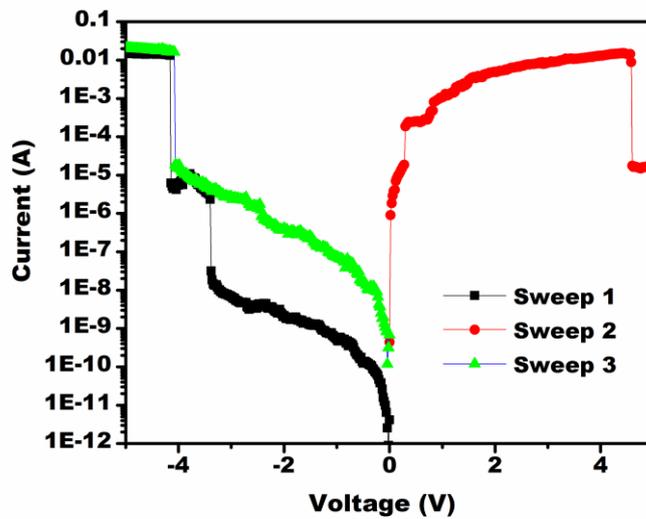
**Figure S2.** TGA curve of DNIBTDT at a heating rate of 10 °C/min under a nitrogen atmosphere.



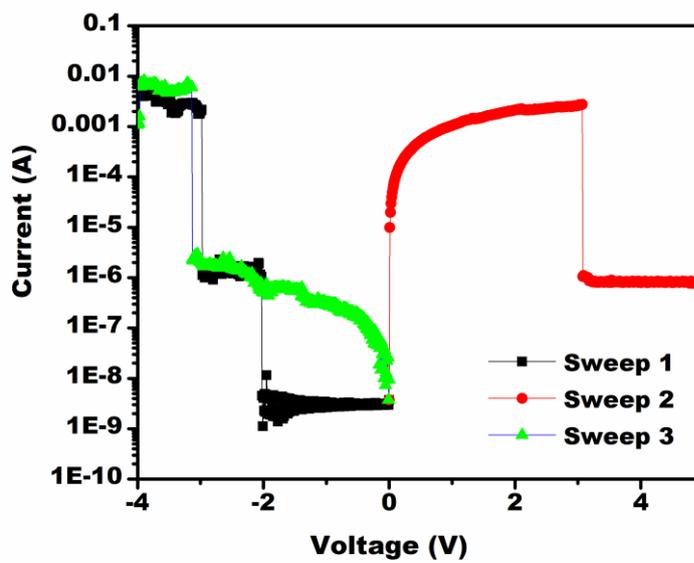
**Figure S3.** The XRD image of DNIBTDT-based film on ITO glass.



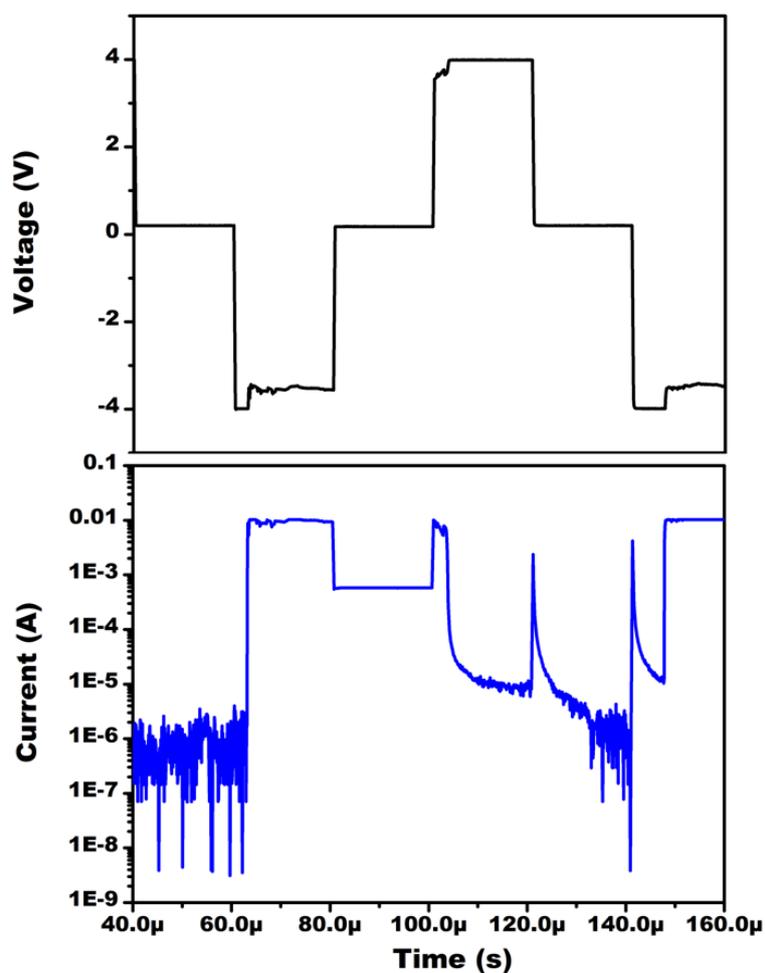
**Figure S4.** (a) Schematic diagram of the sandwich-structured memory device. (b) The SEM image of the cross-section view of DNIBTDT-based memory device.



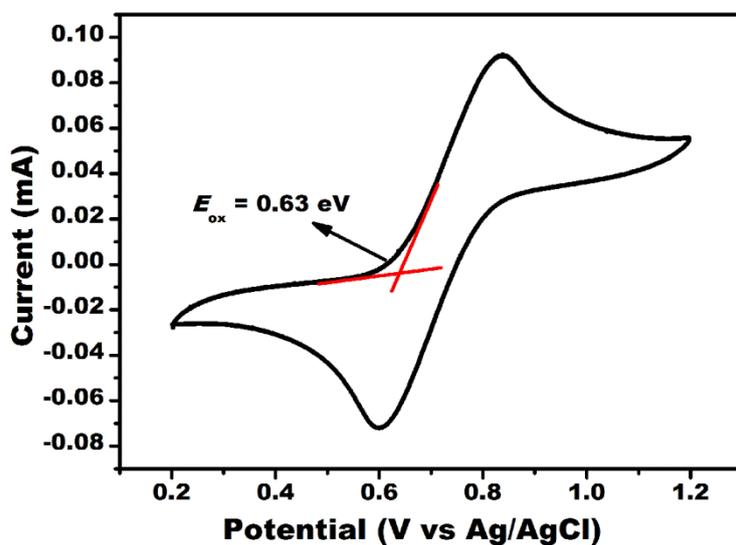
**Figure S5.** The current-voltage (I-V) characteristics of the memory device measured using KEITHLEY 4200-SCS semiconductor characterization system.



**Figure S6.** The current-voltage (I-V) characteristics of the memory device measured using Agilent Technologies B1500A Semiconductor Device Analyzer.



**Figure S7.** Write–multiple read–erase–multiple read cycles. The top and bottom curves are the applied voltage and the corresponding current response, respectively.



**Figure S8.** Cyclic voltammogram of the external ferrocene/ferrocenium ( $F_c/F_c^+$ ) redox standard potential in acetonitrile solution with 0.1M tetrabutylammonium perchlorate as electrolyte.

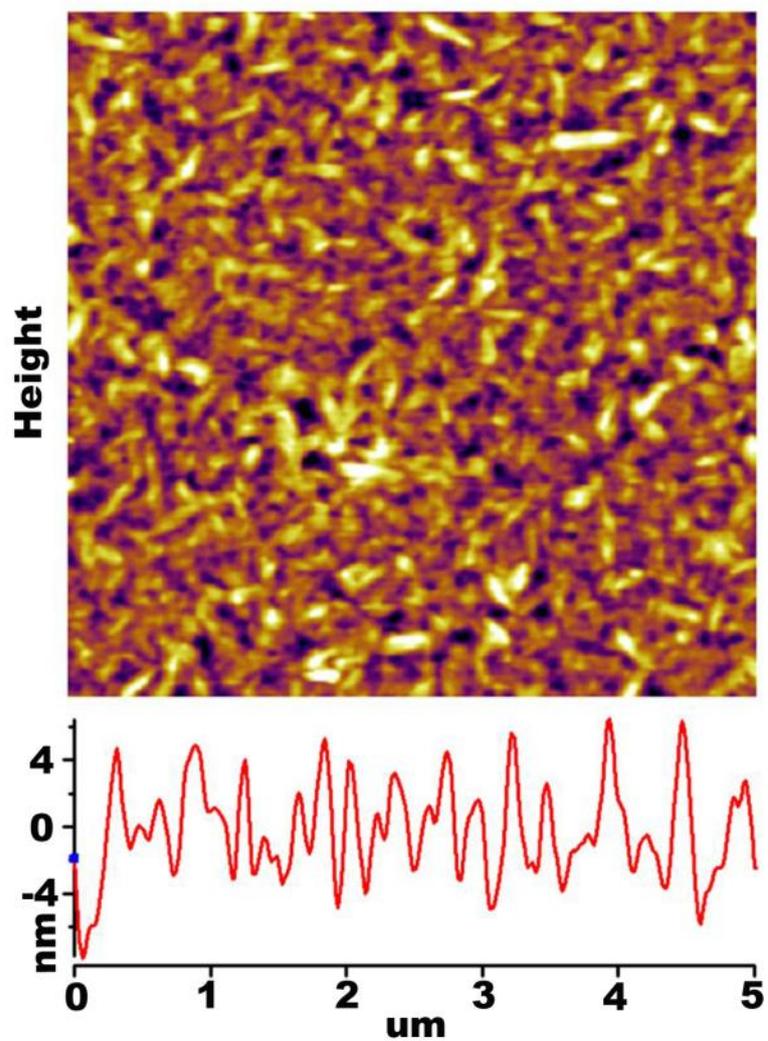
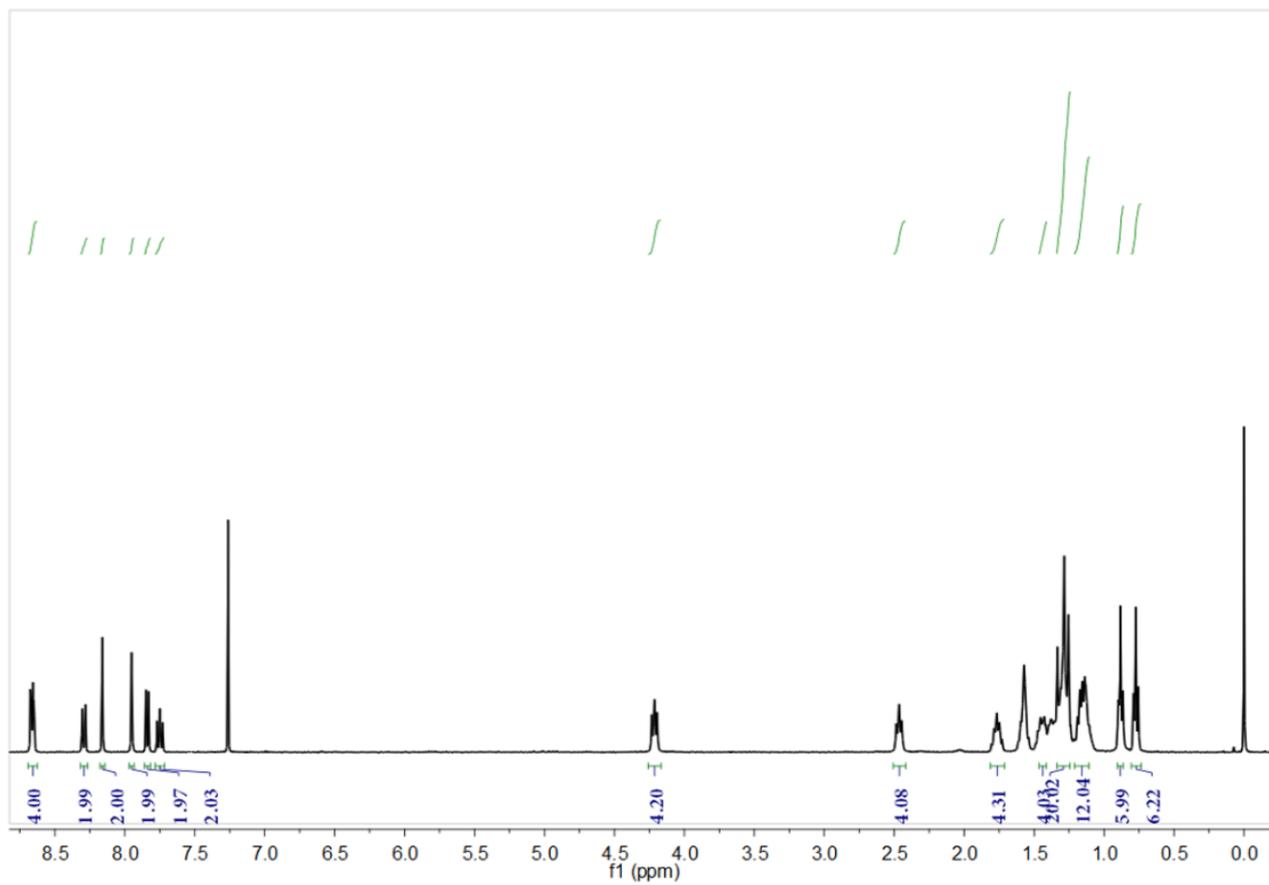


Figure S9. The tapping-mode AFM height image of DNIBTDT-based film on ITO glass.

### 3 NMR



**Figure S10.** <sup>1</sup>H NMR of the target molecule DNIBTDT.