**Table S1** Truth table for 17 two-step ternary logics

| Logic Function | Initial State | Writing | Logic Output |
|----------------|---------------|---------|--------------|
| $F_0$          | 0             |         | 0, 0, 0      |
| $F_1$          | 0             | $q (0, 1, 2)$ | 0, 0, 1      |
| $F_2$          | 0             | $q (0, 1, 2)$ | $V_{base}$ 0, 0, 2 |
| $F_3$          | 0             | $q (0, 1, 2)$ | 0, 1, 2      |
| $F_4$          | 0             | $V_{th1}$ | $q (0, 1, 2)$ | 1, 0, 0      |
| $F_5$          | 0             | $V_{th2}$ | $q (0, 1, 2)$ | 2, 0, 0      |
| $F_6$          | 1             | $q (0, 1, 2)$ | $V_2$ 0, 1, 1 |
| $F_7$          | 1             | 0       | 1, 1, 0      |
| $F_8$          | 1             | $q (0, 1, 2)$ | $V_{th2}$ 0, 2, 0 |
| $F_9$          | 1             | $q (0, 1, 2)$ | $V_{base}$ 1, 2, 2 |
| $F_{10}$        | 2             | 0       | 2, 1, 1      |
| $F_{11}$       | 2             | $q (0, 1, 2)$ | $V_{th2}$ 0, 2, 2 |
| $F_{12}$       | 2             | $q (0, 1, 2)$ | $V_{base}$ 1, 2, 2 |
| $F_{13}$       | 2             | $q (0, 1, 2)$ | $V_{th2}$ 0, 2, 2 |
| $F_{14}$       | 2             | $q (0, 1, 2)$ | $V_{base}$ 1, 2, 2 |
| $F_{15}$       | 2             | $q (0, 1, 2)$ | $V_{th2}$ 0, 2, 2 |

**Table S2** Truth table for 10 three-step ternary logics

| Logic Function | Initial State | Writing | Writing | Logic Output |
|----------------|---------------|---------|---------|--------------|
| $F_3$          | 0             |         |         | 0, 1, 0      |
| $F_{16}$       | 0             | $V_{th1}$ | $q$ | 1, 0, 1      |
| $F_{17}$       | 0             | $V_{th1}$ | $q$ | 1, 0, 2      |
| $F_{18}$       | 0             | $q$ | $V_{th2}$ | 2, 0, 1      |
| $F_{19}$       | 0             | $q$ | $V_{base}$ | 2, 0, 2      |
| $F_{20}$       | 0             | $V_{th2}$ | $q$ | 0, 2, 0      |
| $F_{22}$       | 0             | $q$ | $V_{th2}$ | 0, 2, 0      |
| $F_{23}$       | 2             | $q$ | $V_{th2}$ | 1, 2, 2      |
| $F_{24}$       | 2             | $q$ | $V_{base}$ | 1, 2, 2      |
| $F_{25}$       | 2             | $q$ | $V_{base}$ | 1, 2, 2      |
| $F_{26}$       | 2             | $q$ | $V_{th2}$ | 0, 2, 0      |