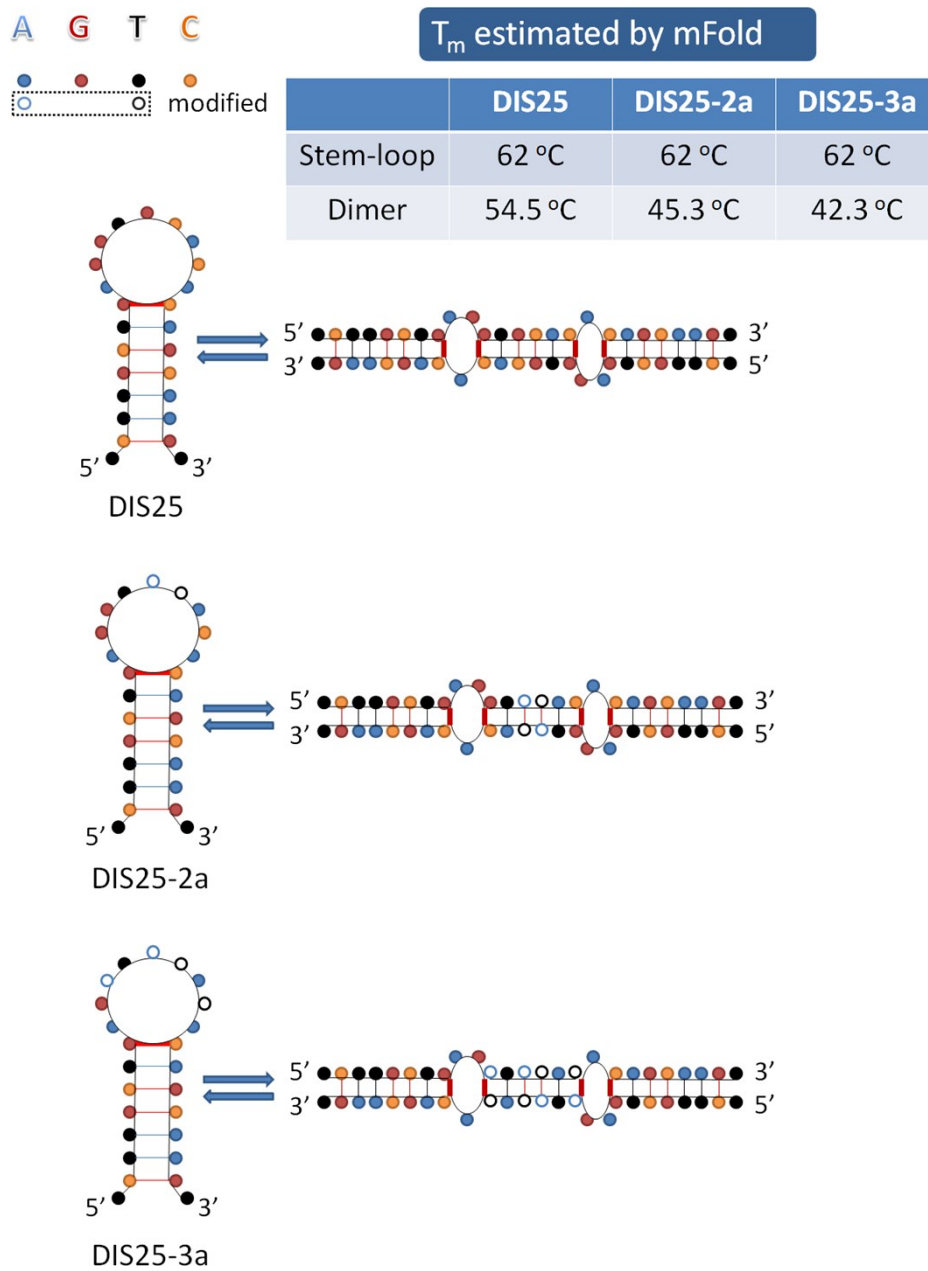


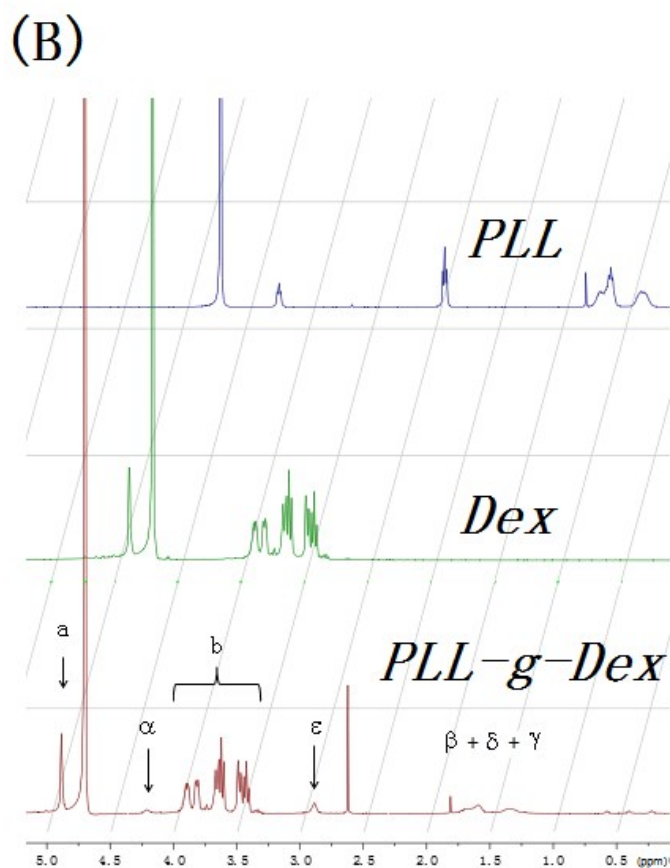
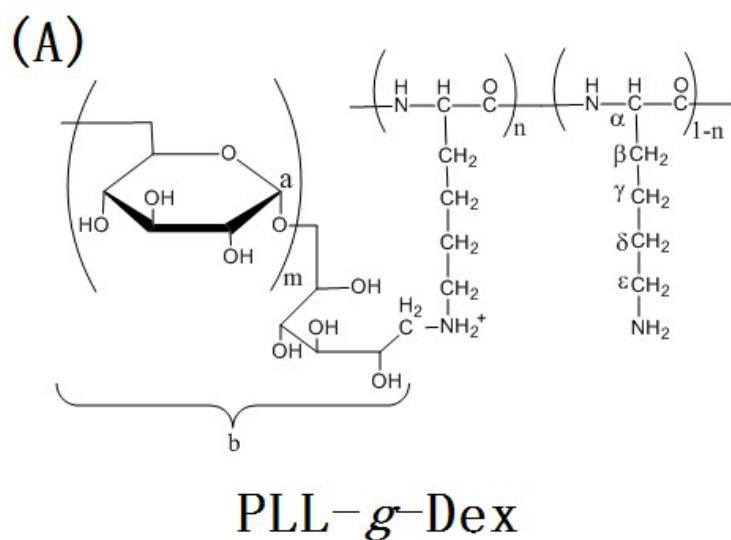
# Supporting Information

## Highly sensitive self-complementary DNA nanoswitches triggered by polyelectrolytes

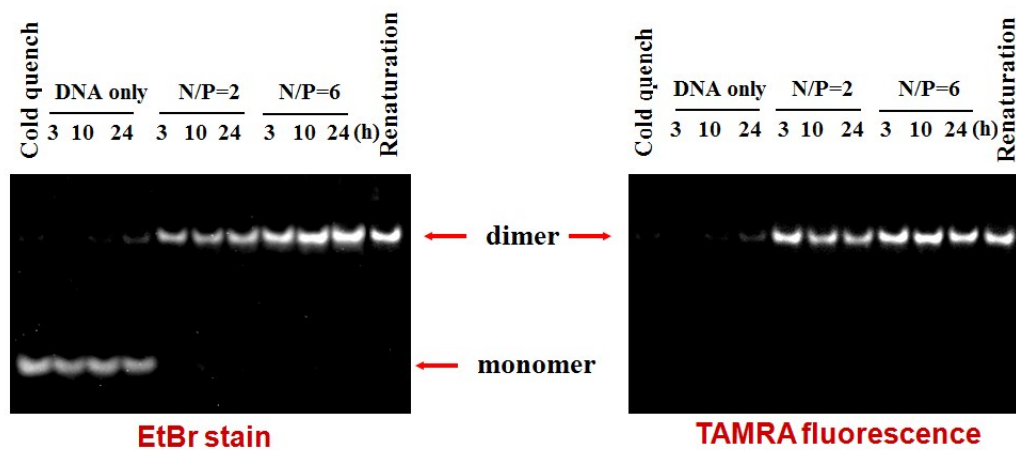
Jincai Wu, Feng Yu, Zheng Zhang, Yong Chen, Jie Du and Atsushi Maruyama



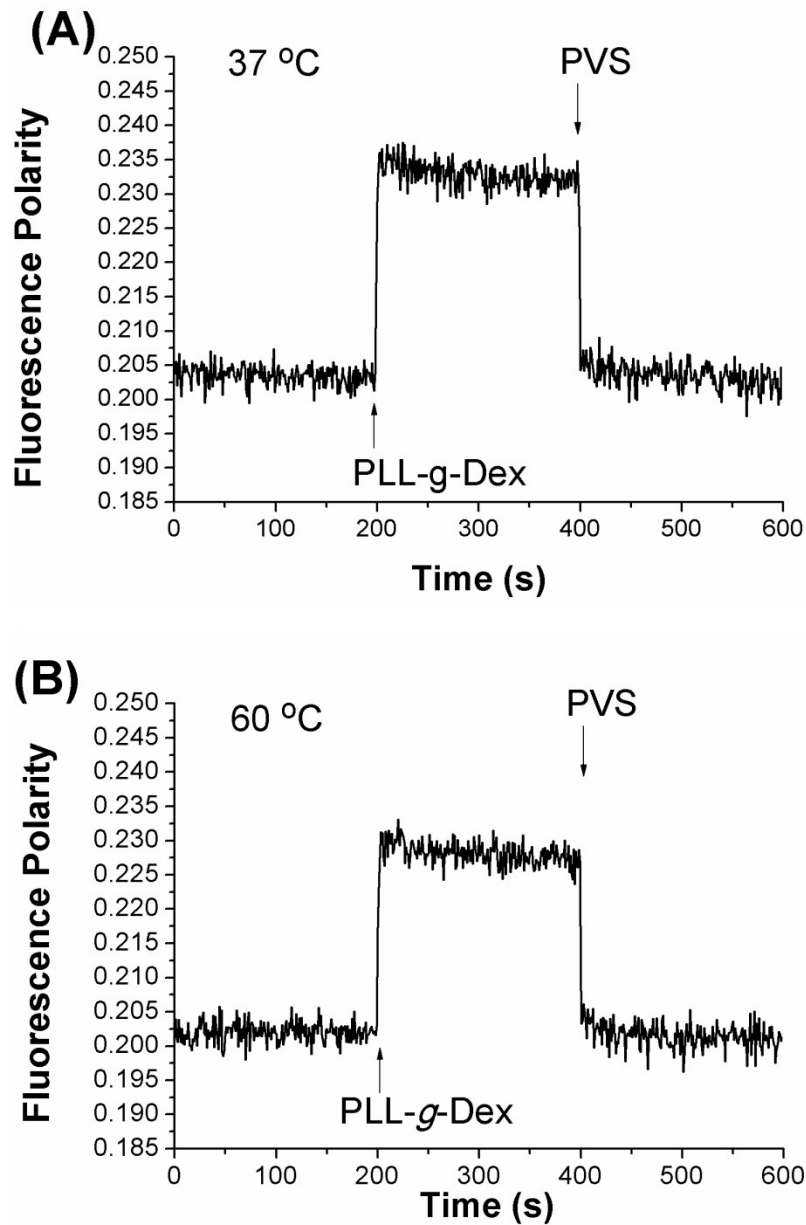
**Figure S1.** Sequences of DIS25, DIS25-2a and DIS25-3a.  $T_m$  of single stem-loop DIS and its dimer were estimated by mFold at 2  $\mu$ M and 150 mM NaCl.



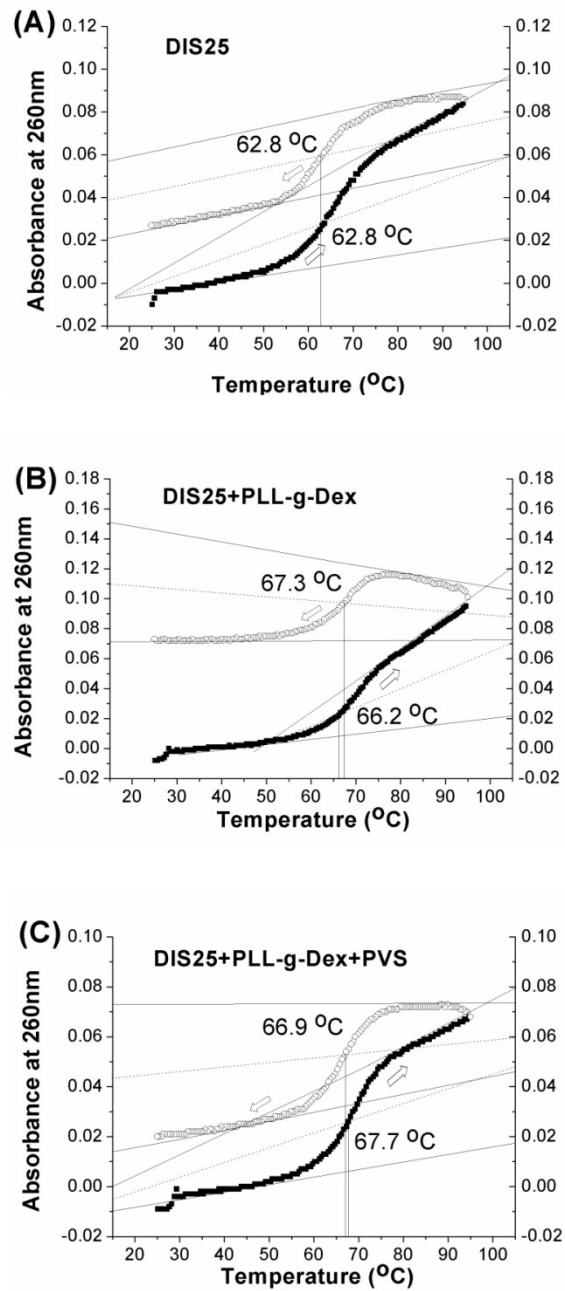
**Figure S2.** (A) Structural formula of poly(L-lysine)-graft-dextran (PLL-g-Dex) copolymer. (B)  $^1\text{H-NMR}$  spectra of PLL, Dex and PLL-g-Dex in  $\text{D}_2\text{O}$ . The dextran content of the copolymer was calculated from  $^1\text{H-NMR}$  signals assigned to PLL( $\epsilon$ - $\text{CH}_2$ ) and dextran( $\text{C}_1\text{-H}$ , a).



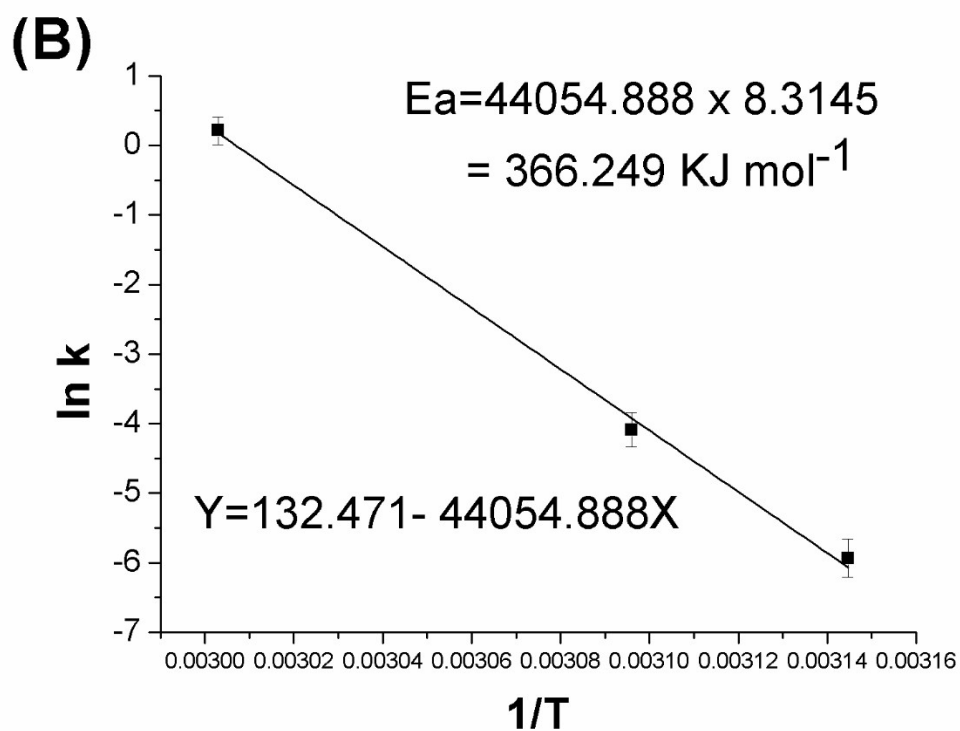
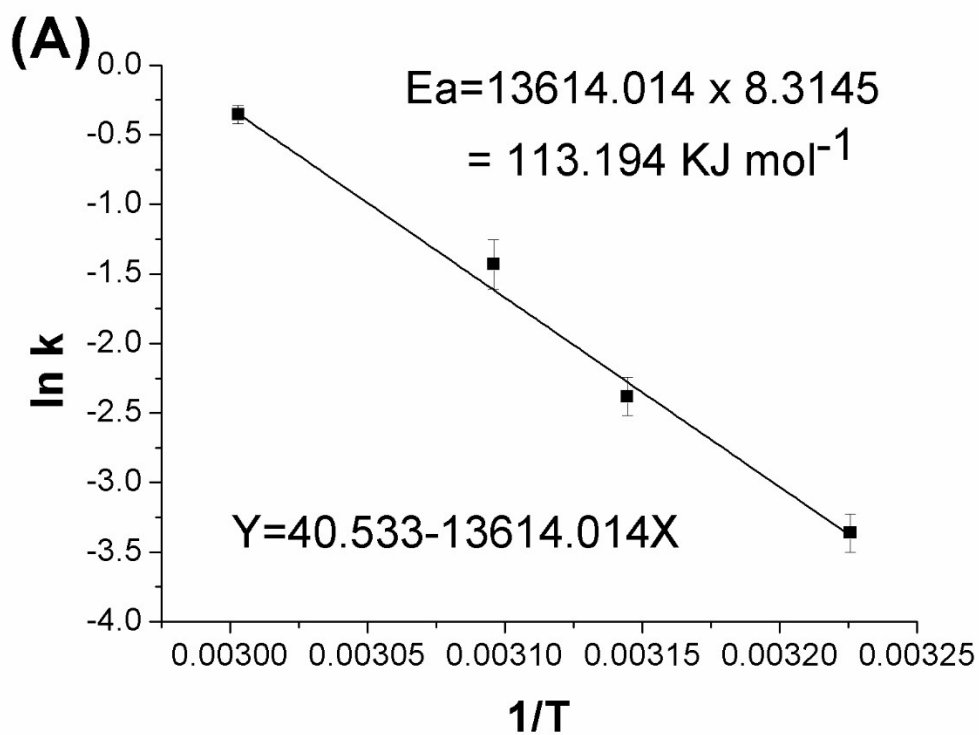
**Figure S3.** Gel electrophoretic analysis of dimerization of DIS25 with ( $N/P = 2$ ,  $N/P = 6$ ) or without PLL-*g*-Dex.  $[DIS25] = 1.6 \mu\text{M}$ ,  $[T-DIS25-D] = 0.4 \mu\text{M}$ , in 10 mM sodium phosphate buffer (pH 7.2, 0.5 mM EDTA, 150 mM NaCl). The DNA samples (far right band) were treated by renaturation process (heating to 90 °C for 5 min and slowly cooling to room temperature). The left gel image was captured with EtBr staining.



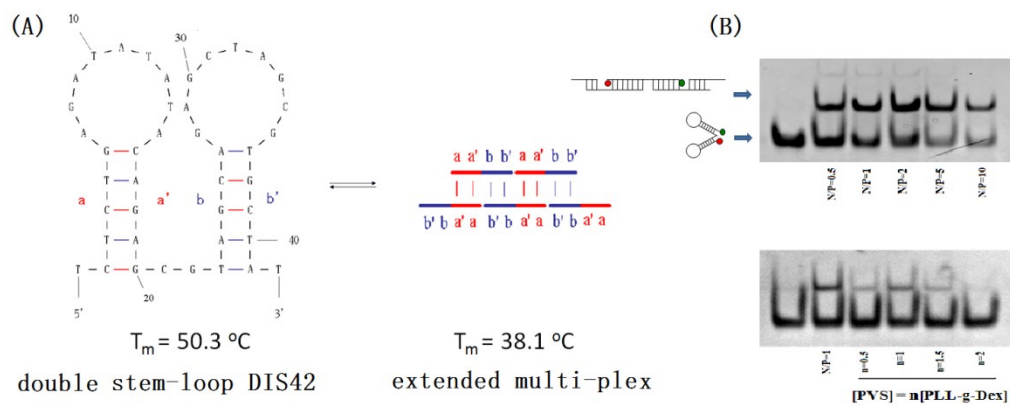
**Figure S4.** Effect of polyelectrolyte on the fluorescence polarity of TAMRA-labeled duplex. Experiments were performed at (A) 37 °C and (B) 60 °C in 10 mM sodium phosphate buffer (pH 7.2) containing 150 mM NaCl and 0.5 mM EDTA. Final concentration of fluorescently labeled DNA duplex (20 bp) was 50 nM. The solution was excited at 540 nm and fluorescence emission was monitored at 570 nm. PLL-g-Dex ( $N/P = 1$ ) and PVS (1.2 times charge concentration) were added sequentially.



**Figure S5.** UV absorption/ $T_m$  profiles. (A) only DIS 25, (B) DIS25 with PLL-g-Dex (N/P=1), (C) PVS (1.2 times excess) in (B). 2  $\mu$ M DIS25 in 10 mM sodium phosphate buffer (pH 7.2, 0.5 mM EDTA, 150 mM NaCl). The mixture were heated at 95 °C for 3 min and gradually cooled to r.t. UV spectra at 260 nm was recorded and melting curves were obtained at a heating rate of 0.5 °C/min (solid) and a cooling rate of 0.5 °C/min (hollow).



**Figure S6.** Arrhenius plots for (A) spontaneous dissociation of DIS25 dimer (B) PLL-g-Dex-assisted dimerization of DIS25.



**Figure S7.** (A) Switching between double stem-loop DIS42 and extended multi-plex driven by PLL-g-Dex and PVS. (B) Gel electrophoretic analysis to confirm transconformation between extended multi-plex and double stem-loop DIS42 in response to addition different concentration of PLL-g-Dex (up) and PVS (down). [DIS42] =  $1.6\text{ }\mu\text{M}$ , [T-DIS25-D] =  $0.4\text{ }\mu\text{M}$ , in 10 mM sodium phosphate buffer (pH 7.2, 0.5 mM EDTA, 150 mM NaCl),  $37\text{ }^\circ\text{C}$  for 2 h. Gel images were captured with EtBr staining. (up) From left to right: DIS42 alone, N/P=0.5, N/P=1, N/P=2, N/P=5, N/P=10. (down) From left to right: DIS42 alone, N/P=1, [PVS]=0.5[PLL-g-Dex], [PVS]=1[PLL-g-Dex], [PVS]=1.5[PLL-g-Dex], [PVS]=2[PLL-g-Dex].