

# Design of MEMS based 4-Bit Shift Register

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**Introduction:** The unique model works on the principle of electro mechanical actuation, consisting of 16 cantilevers each representing bit level logical operation.

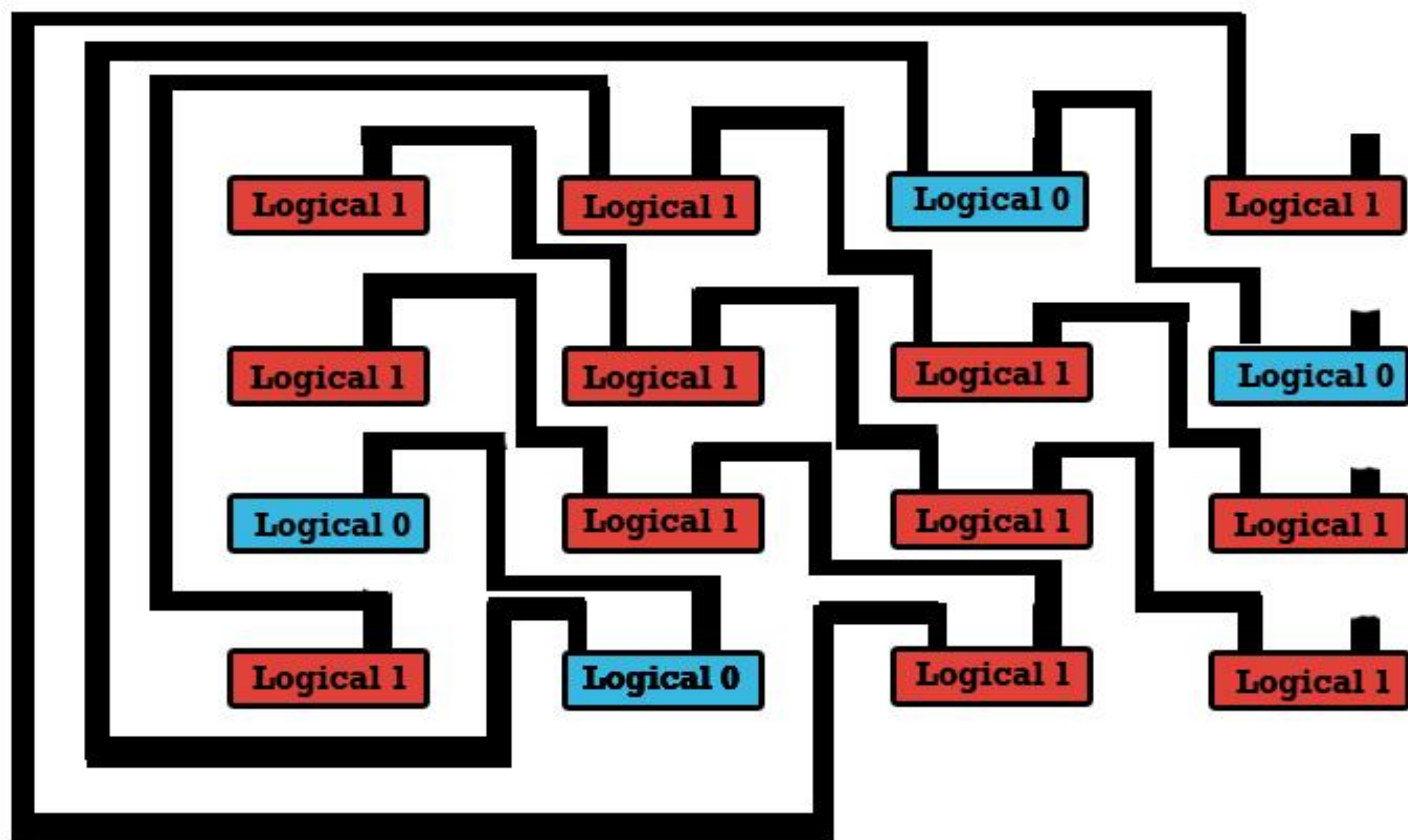


Figure 1. Block diagram of 4-bit shift register

**Proposed Method:** Each block represents one switch. If bit is logic '1' then switch output is logic '1' connected to electrode of bit in next stage triggering it to logic '1' as well. When bit is '0' then switch output is logic '0' and is transferred to the next stage, resulting in shifting operation.

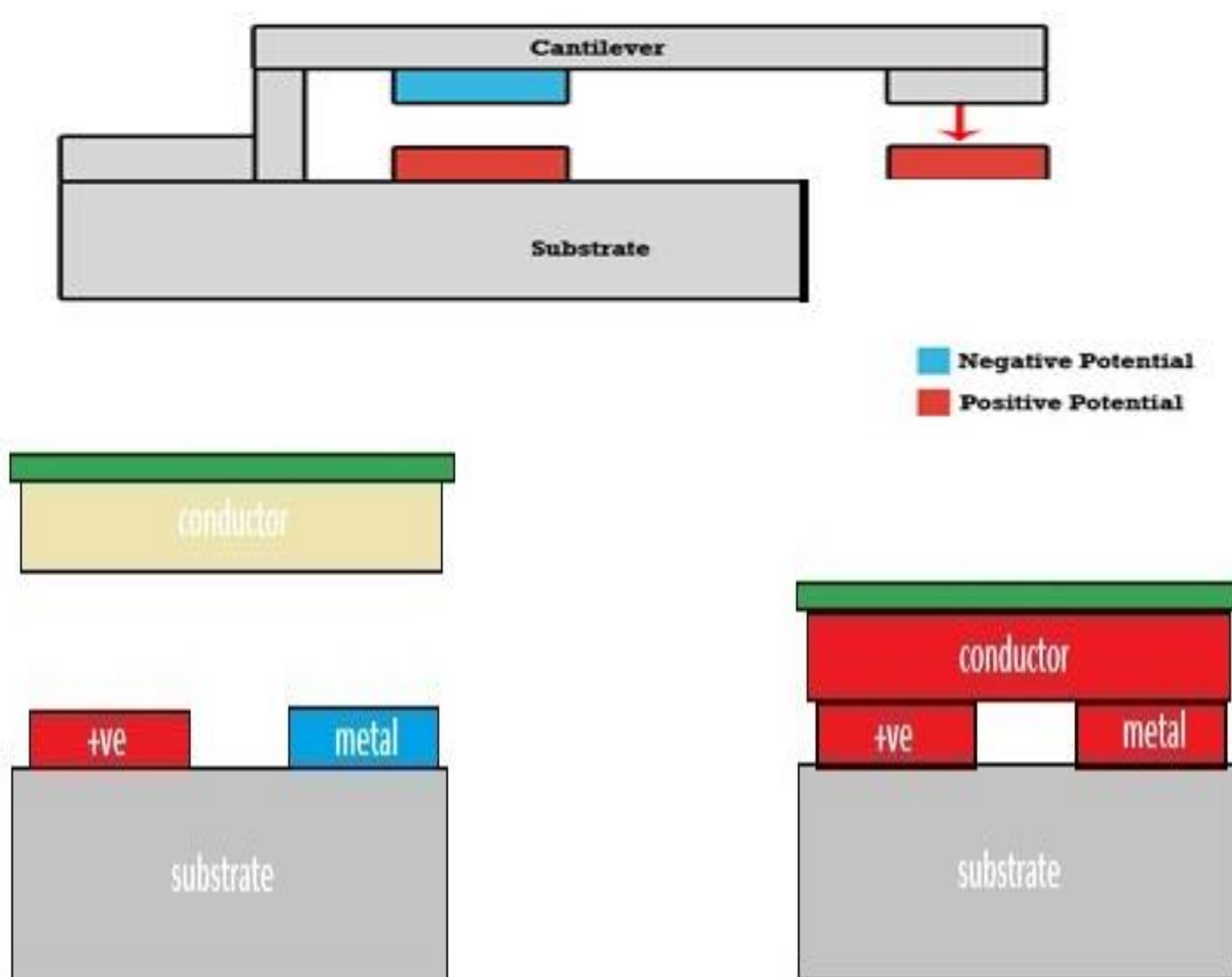


Figure 2. Side view and front view of switch

**Results:** Given logical data is 1101 at the first stage and after shifting operation at the third stage the obtained data is 1110 shown in figure. 3. Red color indicates positive potential and is 20V and blue color indicates negative potential shown in figure. 4.

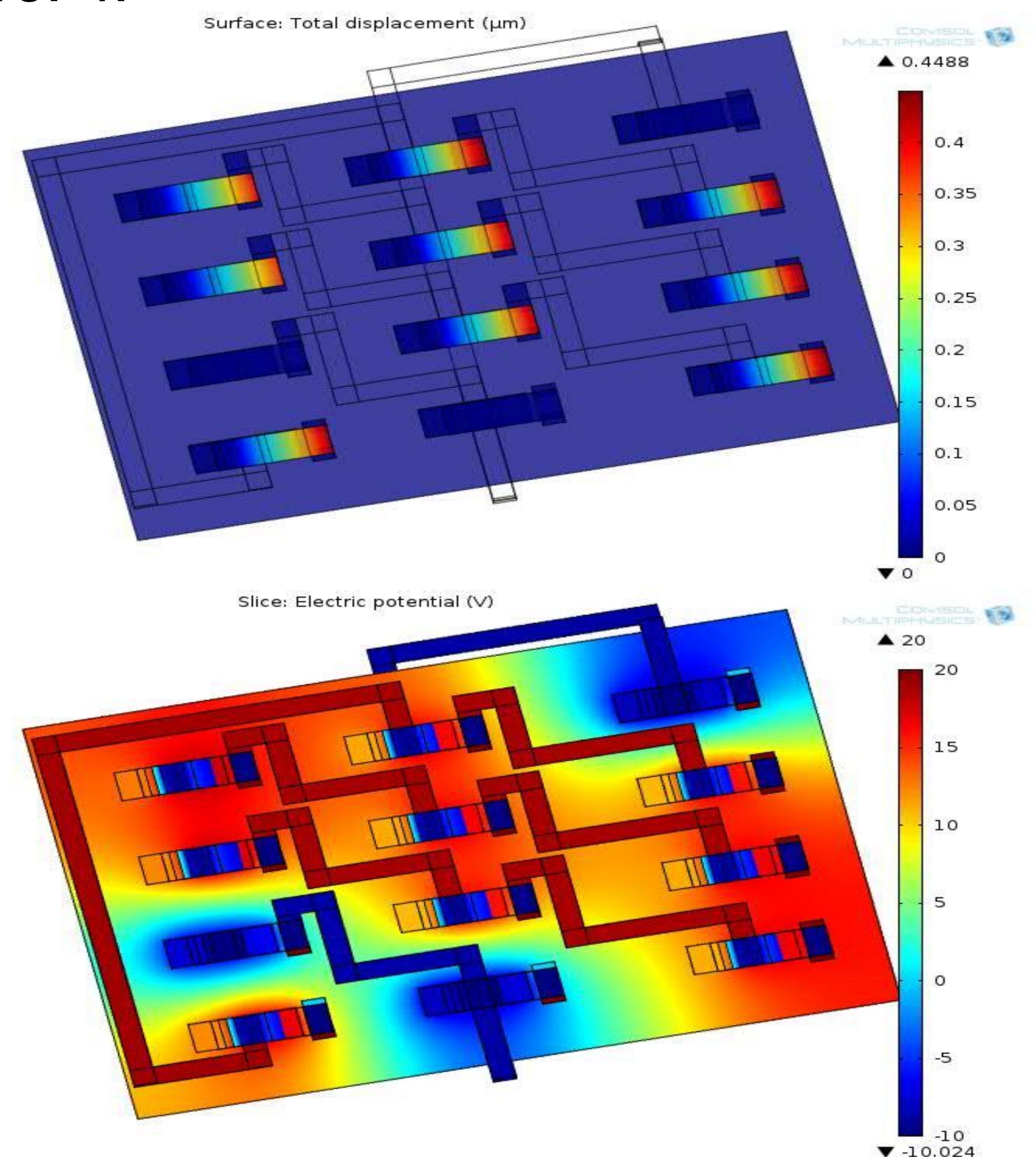


Figure 3. Deflection of cantilevers Figure 4. Voltage scale

**Conclusion:** MEMS shift register has dimensions 100x60  $\mu\text{m}$  which is small compared to conventional shift register of 1-4mm dimension. As mechanical deflection it is accurate.

## References:

1. Angell, J.B., Terry, S.C., Barth, P.W., *Silicon Micromechanical Devices Scientific American*, April 1983, Vol. 248.
2. Hui Li and Erik K. Antonsson "Evolutionary Techniques in MEMS Synthesis".
3. *The Spiral RF MEMS Switch* in COMSOL Multiphysics.