

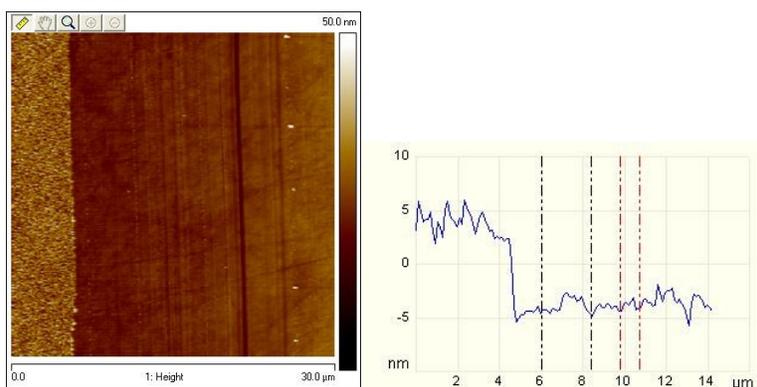
## Supplementary Information

### Ultrafast Switching and Linear Conductance Modulation in Ferroelectric Tunnel Junctions via P(VDF-TrFE) Morphology Control

Sayani Majumdar

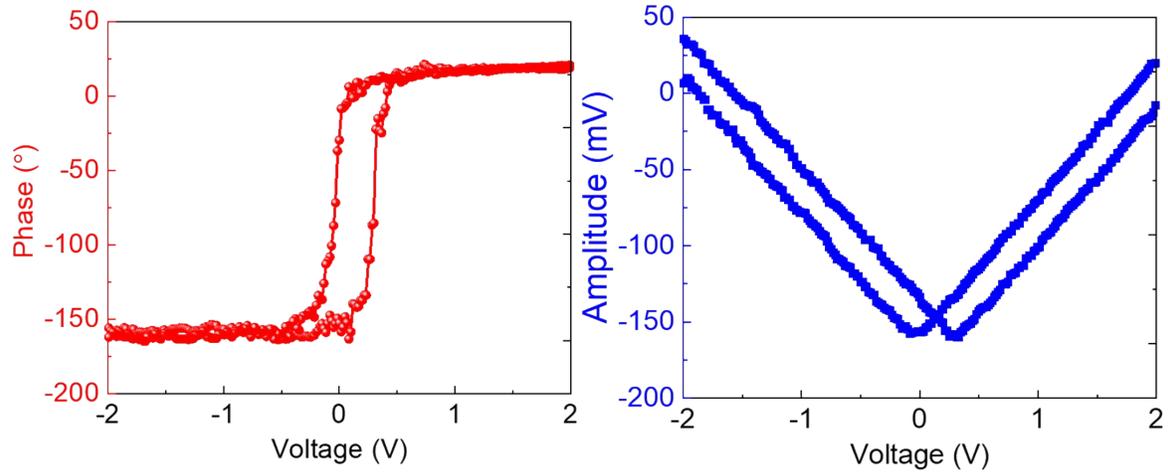
VTT Technical Research Centre of Finland Ltd., P.O. Box 1000, FI-02044 VTT, Finland

#### S1. Atomic-force microscopy (AFM)



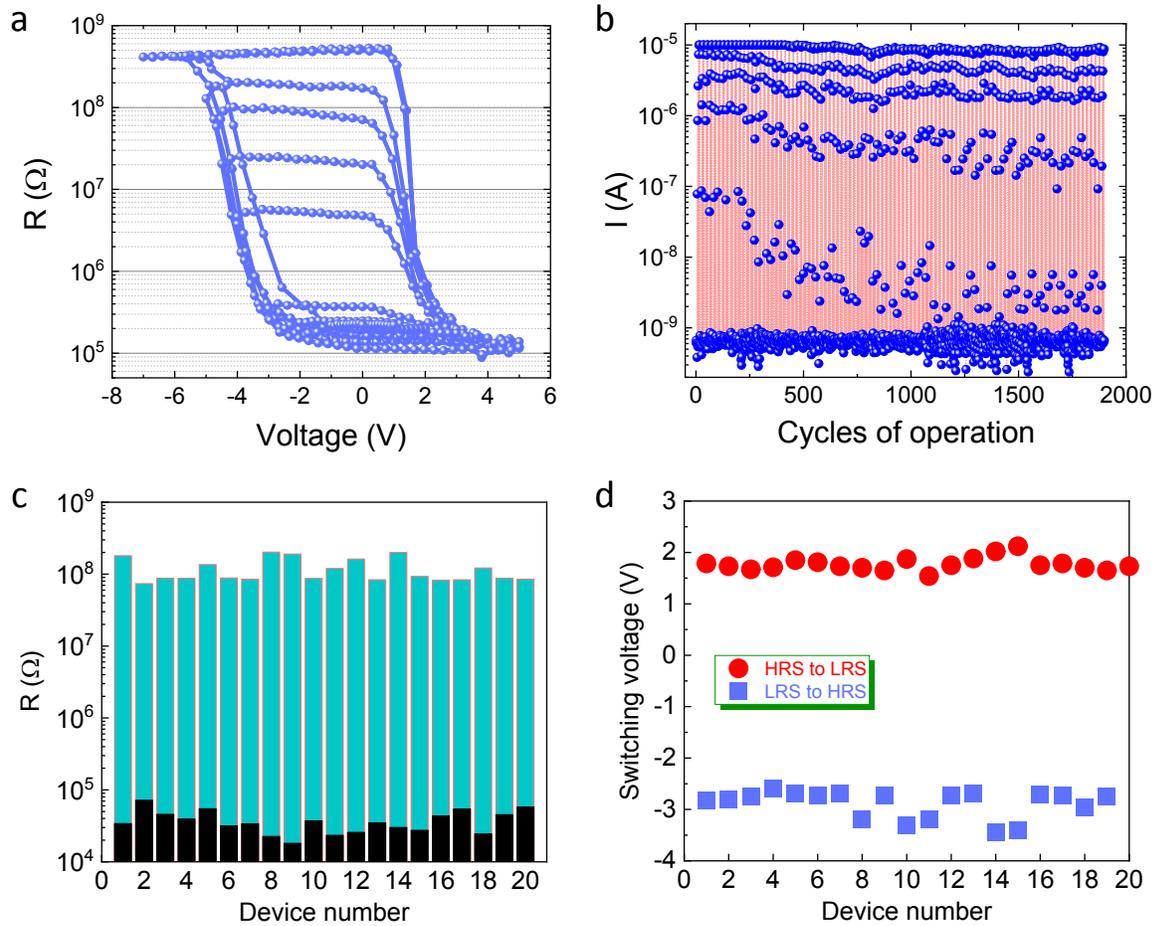
**Fig. S1** | Thickness of the P(VDF-TrFE) layer measured with AFM on the prepared step-edges of the sample.

## S2. Piezo-force microscopy (PFM)



**Fig. S2** | Local PFM hysteresis loops of a 6-nm-thick P(VDF-TrFE) film on a 1% Nb-doped SrTiO<sub>3</sub> substrate. The red and blue curves indicate change in phase and amplitude upon sweeping the voltage from positive to negative and reverse direction, respectively.

### S3. Switching reproducibility and device-to-device variation



**Fig. S3** | **a**, Analog resistance switching in a typical P(VDF-TrFE) based FTJ memristor - multiple, stable resistance states can be obtained by complete or partial rotation of ferroelectric domains when the devices are subjected to varying range of sweeping voltages. **b**, Reproducibility of consecutive switching between the high- and low-resistance states and four other intermediate resistance levels. It was found that higher current levels are extremely reproducible while the lower current states show certain randomness over cycle to cycle. **c,d**, Device-to-device variation

of the high- and low-resistance states (c) and switching voltage (d) for 20 FTJ memristors on the same sample. No significant variation in samples from batch-to-batch was found.