Top-gate Inserted Dual-gate Indium-Gallium-Zinc Oxide Thin-Film Transistors and Prospects for Flexible Applications

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In this study, dual-gate (DG) thin-film transistors (TFTs) based on indium-gallium-zinc oxide (IGZO) with inserted top-gate electrode has been developed. The transfer characteristics of such DG TFTs were measured, and the source/drain (S/D) resistance was extracted. Overall, the modulation of threshold voltage (V_{th}) was given by applying a series of top-gate voltages (V_{TG}). There performances are compared with the state-of-art DG technologies.

The electrical performances of DG TFTs have been compared with the single-gate (SG) TFT technologies of both bottom-gate (BG) and top-gate (TG) structures. It is concluded that DG technology have advantages compared to SG for the application of circuit design, sensor achievement and other flexible integration systems, with almost doubled effective field-effect mobility, an extra independently adjustable port for V_{th} control, and much better electrical stability behaviors by applying comparable TG and BG voltages which can neutralize electric field of the channel region during stress conditions.

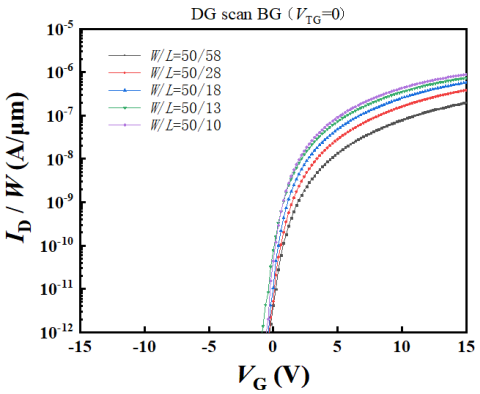

Fig. 1. Transfer characteristics of DG TFTs by scanning V_{BG} with V_{TG} fixed at 0V.

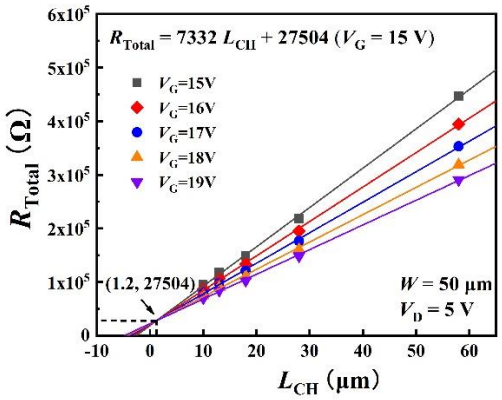

Fig. 2. Source/drain resistance extraction.

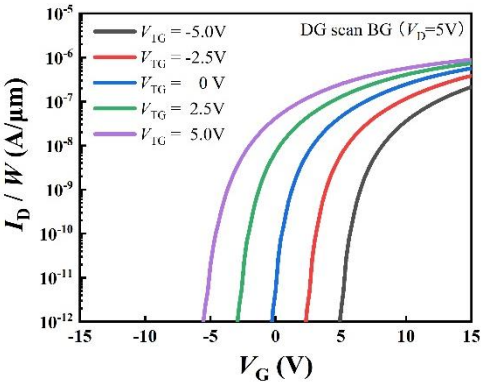

Fig. 3. V_{th} modulation by V_{TG}.

References

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