Paper:

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Supporting Information

Non-destructive method for mapping metal contact diffusion in In_2O_3 thin-film transistors

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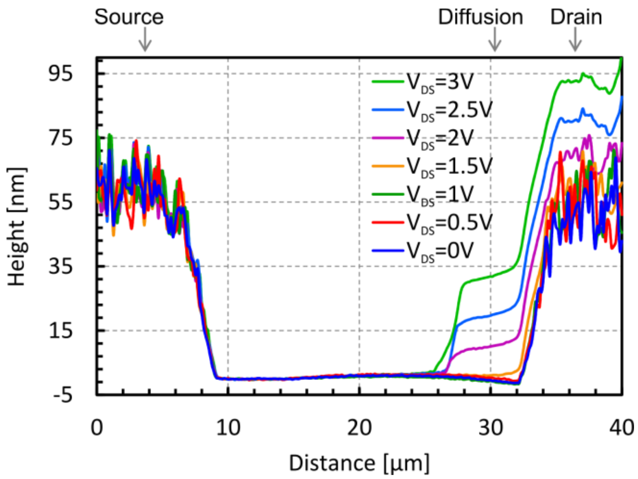

Figure S1. Height line scans for V_{DS} from 0V to 3V demonstrate the electrostatic contribution to the apparent morphology of the sample and for the drain bias $V_{DS} > 2V$ position of the diffusion region can be determined.

The values of the drain current I_{DS} at V_{GS}=10 V and V_{DS}=16 V are given in Table 1S for the double spin and single spin In_2O_3 TFTs. The channel length L was measured using AFM topography scans as a distance from source to drain electrodes. The same value of L was observed in the SKPM potential profiles measured when the TFT terminals are grounded. The effective channel length L_{eff} is estimated as a difference between channel length L and a length of the diffusion region L_{diff}: $L_{eff} = L - L_{diff}$.

Table S1.

	Spin coating	L [µm]	L_{diff} [µm]	L_{eff} [µm]	I_{DS} [µA/µm]
Device 1	Double Spin	36.5	3.5	33	35
Device 2	Double Spin	28	9	19	140
Device 3	Single Spin	35	4	31	0.6
Device 4	Single Spin	25.6	5.5	20.1	5

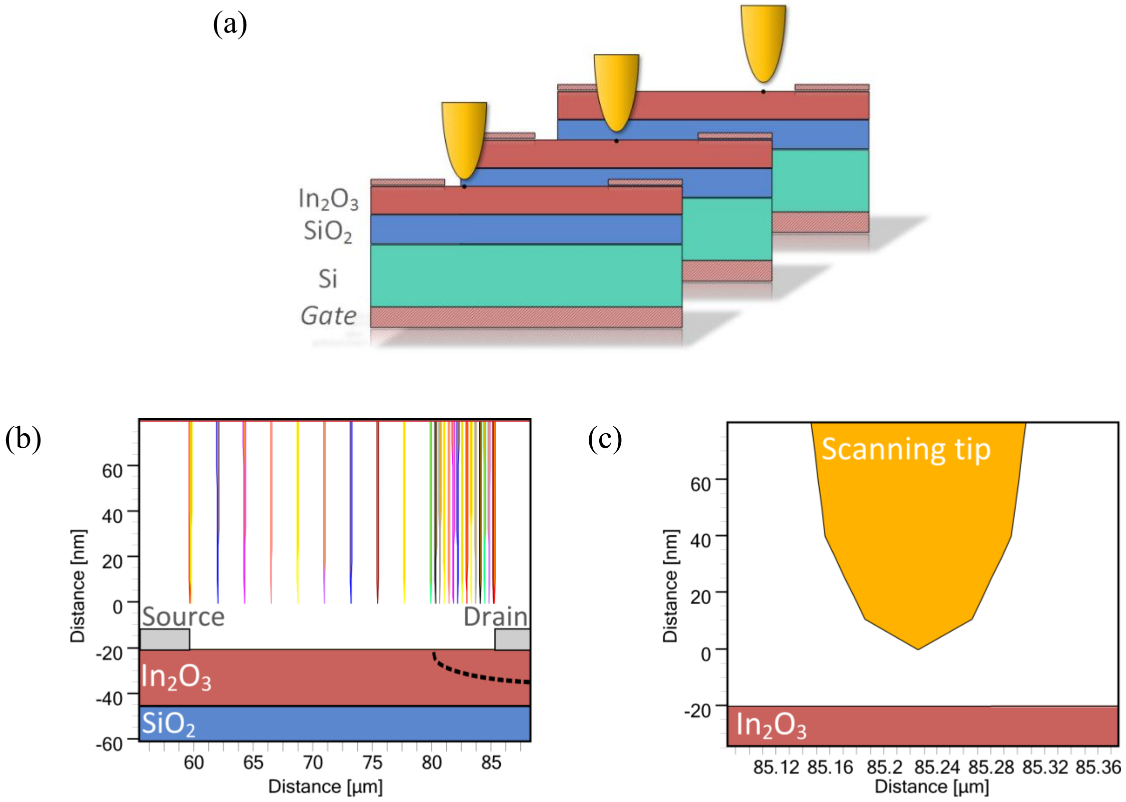

Figure S2. (a) Schematic of the simulated tip movement. (b) Tip positions used in the simulations, 25 tip positions were used. (c) Tip structure used in the simulation.

In the simulations a scanning Si tip with the radius of 80 nm and 20 nm tip-sample separation as shown in Figure S2 (c) was used. The tip was then moved above the surface to reconstruct the surface potential (Figure S2 (a)). To simulate the tip movement for every tip position a new tip-sample structure was simulated. In total 25 tip-sample structures for various tip positions were simulated to recover the surface potential. The tip was moved along the surface with a changing step size, more positions were considered at the drain side along the diffusion region (Figure S2 (b)). During conventional SKPM a DC voltage is applied on a tip to nullify the contact potential difference. For the simulation the ideal surface potentials were first extracted without tip structure used in a calculation. Then for every tip position a previously extracted ideal surface potential value was used as a value of a tip DC bias which leads to nullification of the contact potential difference. After applying a tip bias a new surface potential value was extracted below the tip apex. Then a scanned surface potential was reconstructed from the recorded surface potential values with respect to the tip position coordinate. This allows evaluating the electrostatic influence of the tip apex on the measurement results.