Supplementary Information (SI) for Materials Advances.
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Supporting Information

Optimization of Drop-casting Parameters for Fabrication of n-type Accumulation Mode Organic Electrochemical Transistors (OECTs) Using gNDI-Br_2

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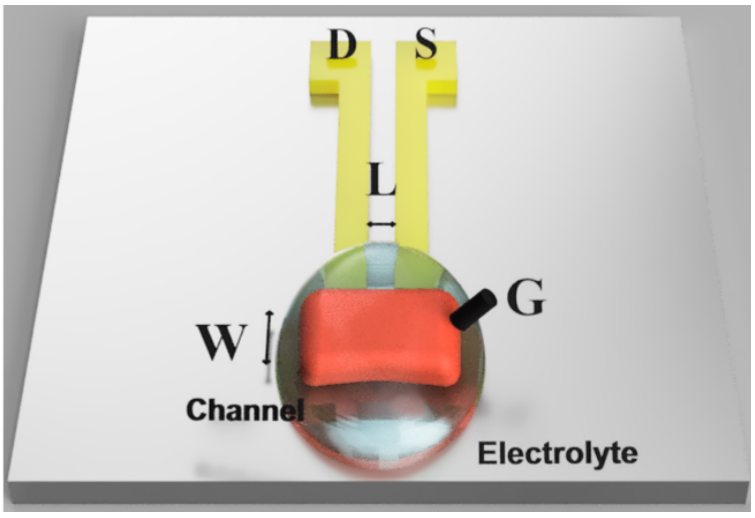

Figure. S1. Schematic image of an OECT. W and L represent the width and length of the channel, while S, D, and G denote the source, drain, and gate electrodes of the OECT.

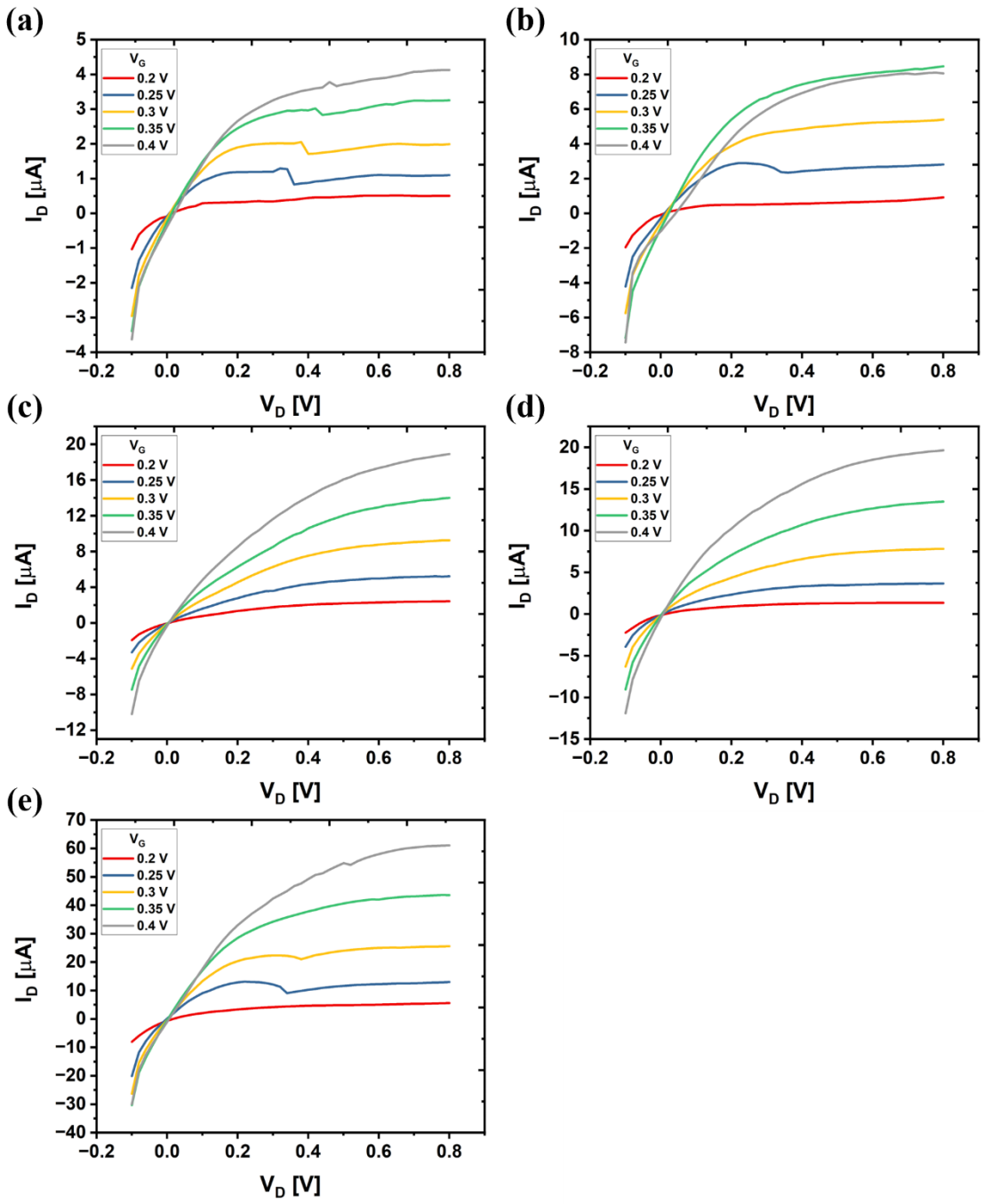

Figure S2. Output characteristics of drop-casted gNDI-Br_2 OECTs measured with a 100 mM NaCl electrolyte and Ag/AgCl gate electrode with a Length (L) of 10 μm, fabricated using different concentrations: (a) 10 mg mL^{-1}, (b) 20 mg mL^{-1}, (c) 30 mg mL^{-1}, (d) 40 mg mL^{-1}, and (e) 50 mg mL^{-1}.

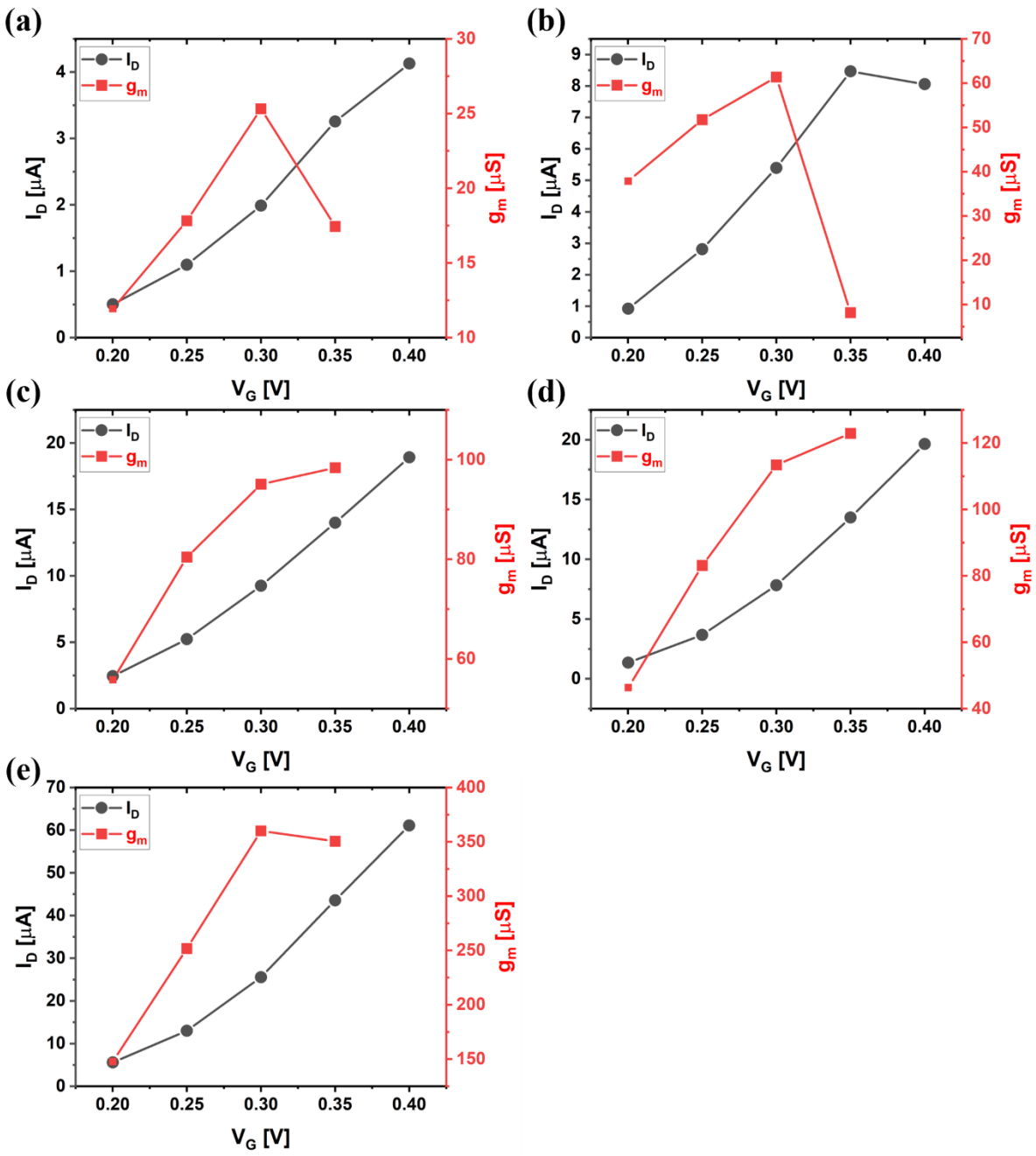

Figure S3. Transfer and transconductance curves of drop-casted gNDI-Br_2 OECTs measured with a 100 mM NaCl electrolyte and Ag/AgCl gate electrode with a length (L) of 10 µm, fabricated using different concentrations: (a) 10 mg mL^{-1}, (b) 20 mg mL^{-1}, (c) 30 mg mL^{-1}, (d) 40 mg mL^{-1}, and (e) 50 mg mL^{-1}.

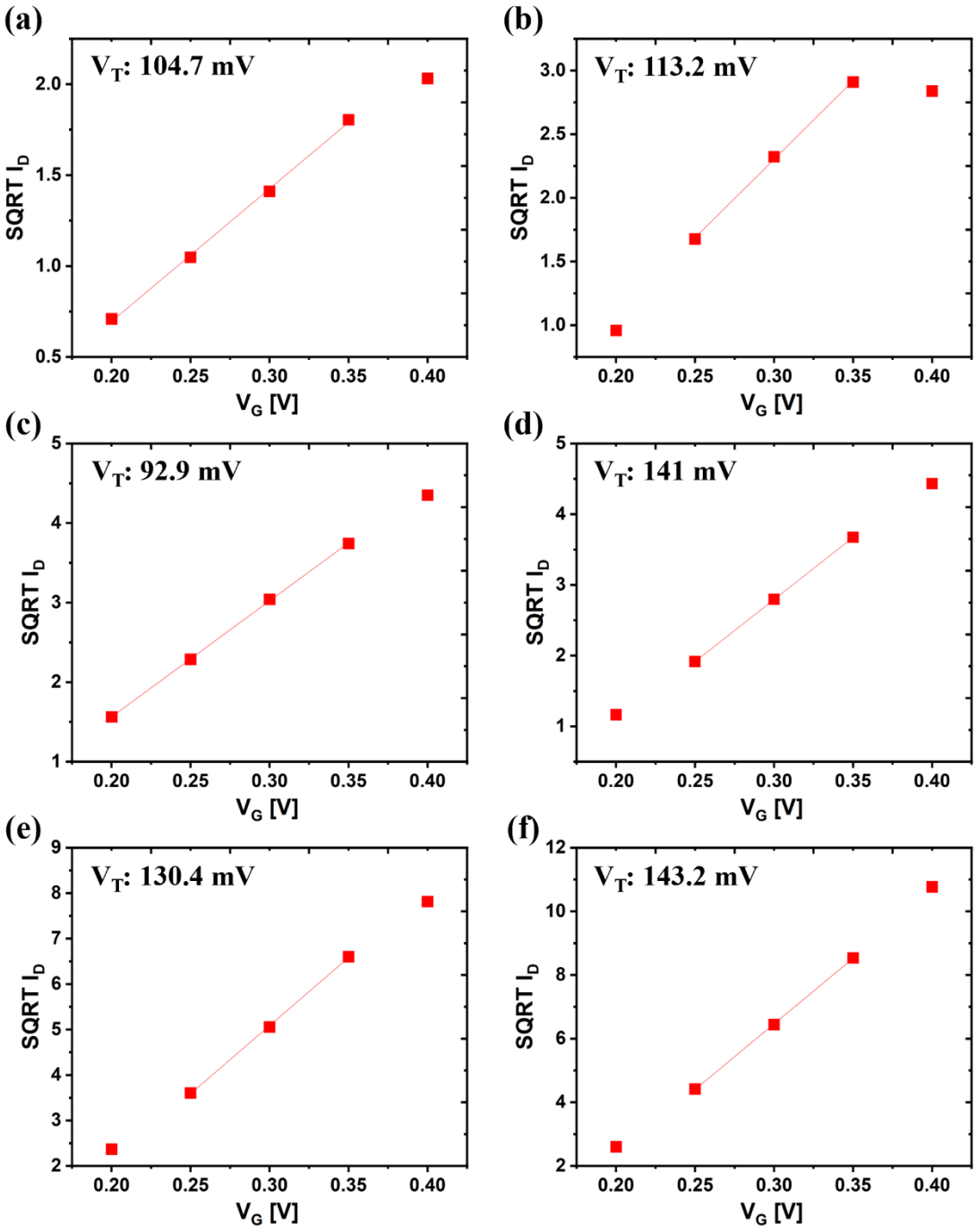

Figure S4. The sqrt (I_D) vs V_G Curves of Drop-casted gNDI-Br_2 OECTs, Measured with a 100 mM NaCl Electrolyte and Ag/AgCl Gate Electrode, Fabricated with a Length (L) of 10 µm Using Different Concentrations and Calculated Threshold Voltages: (a) 10 mg mL^{-1}, (b) 20 mg mL^{-1}, (c) 30 mg mL^{-1}, (d) 40 mg mL^{-1}, (e) 50 mg mL^{-1}, and (f) 100 mg mL^{-1}

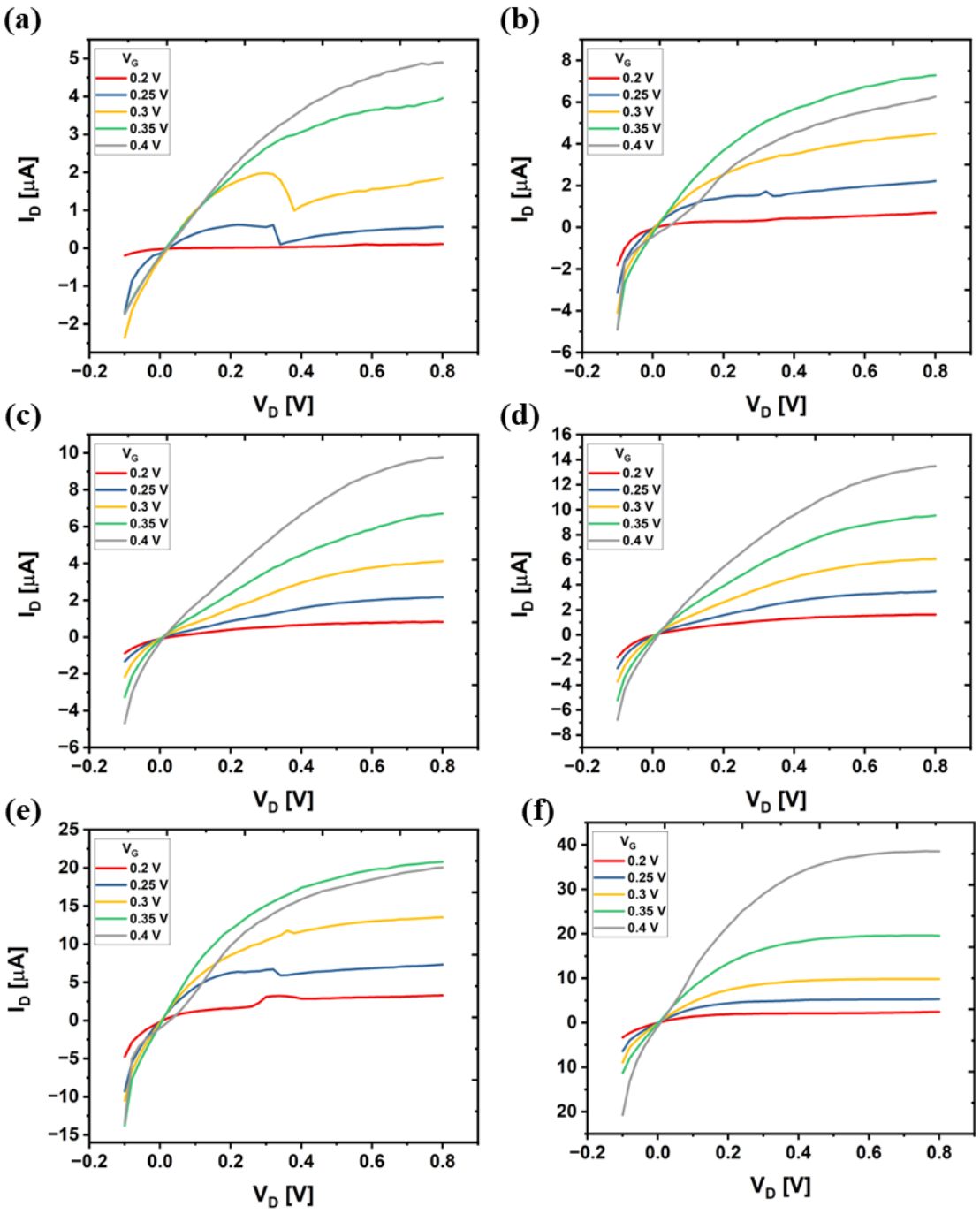

Figure S5. Output characteristics of drop-casted gNDI-Br_2 OECTs with a channel length (L) of 20 μm, fabricated using different concentrations: (a) 10 mg mL^{-1}, (b) 20 mg mL^{-1}, (c) 30 mg mL^{-1}, (d) 40 mg mL^{-1}, (e) 50 mg mL^{-1}, and (f) 100 mg mL^{-1}. All measurements were performed using a 100 mM NaCl electrolyte and Ag/AgCl gate electrode

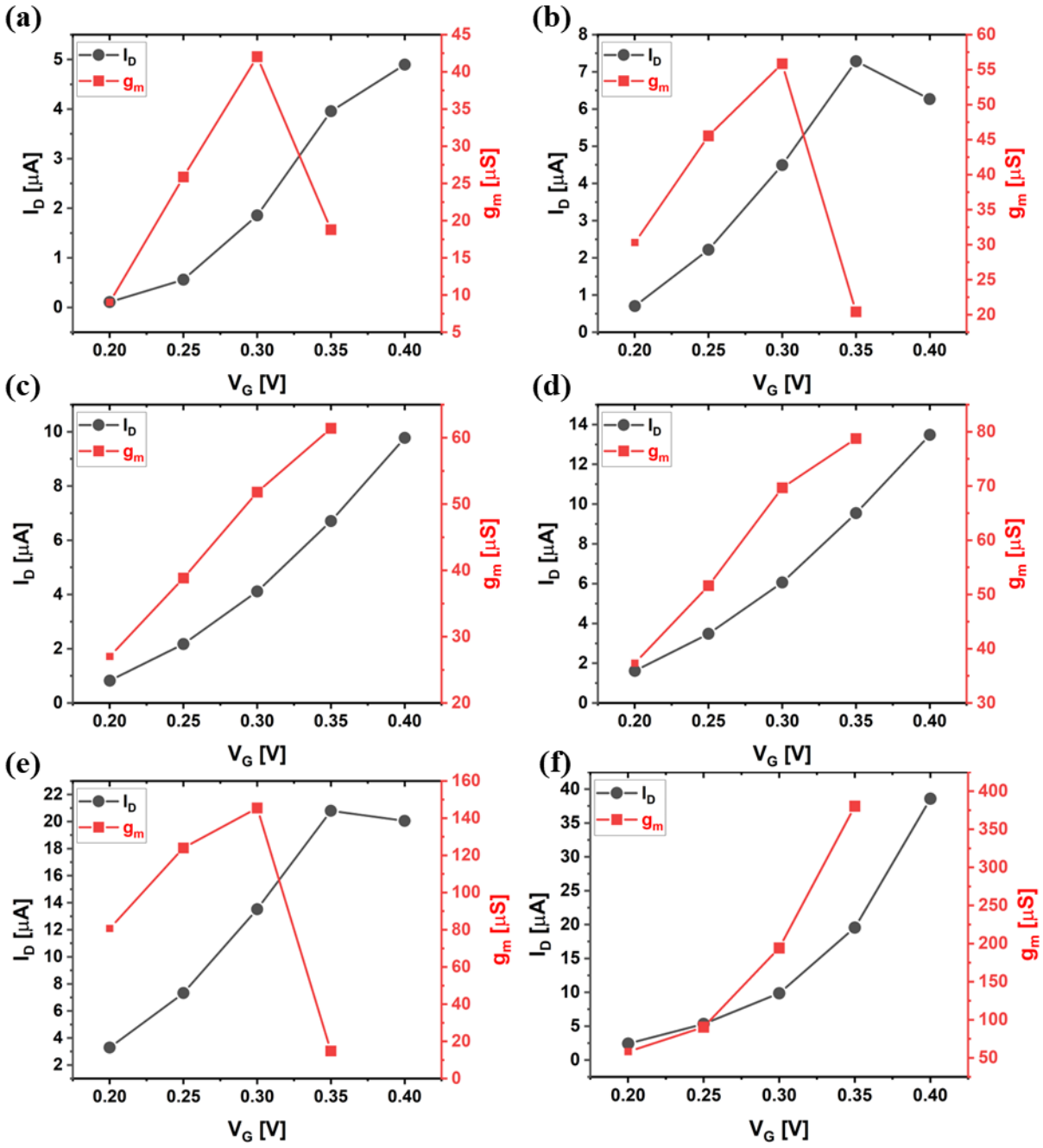

Figure S6. Transfer and transconductance curves of drop-casted gNDI-Br_2 OECTs with a channel length (L) of 20 µm, fabricated using different concentrations: (a) 10 mg mL^{-1}, (b) 20 mg mL^{-1}, (c) 30 mg mL^{-1}, (d) 40 mg mL^{-1}, (e) 50 mg mL^{-1}, and (f) 100 mg mL^{-1}. All measurements were performed using a 100 mM NaCl electrolyte and Ag/AgCl gate electrode.

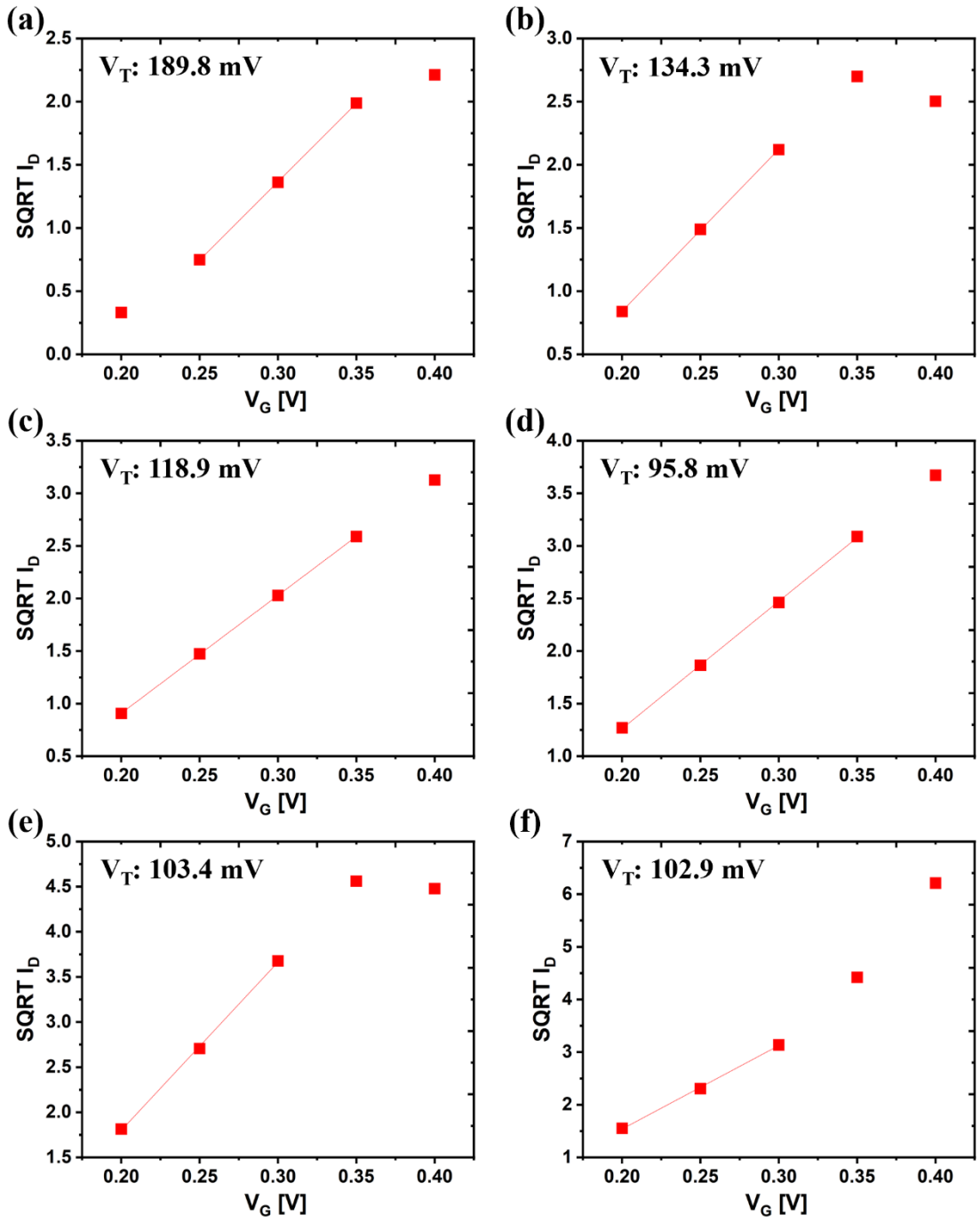

Figure S7. Square root of drain current (sqrt (I_D)) vs V_G curves of drop-casted gNDI-Br_2 OECTs with a Length (L) of 20 µm used for calculating threshold voltages (V_T). The devices were fabricated using different concentrations: (a) 10 mg mL^{-1}, (b) 20 mg mL^{-1}, (c) 30 mg mL^{-1}, (d) 40 mg mL^{-1}, (e) 50 mg mL^{-1}, and (f) 100 mg mL^{-1}.

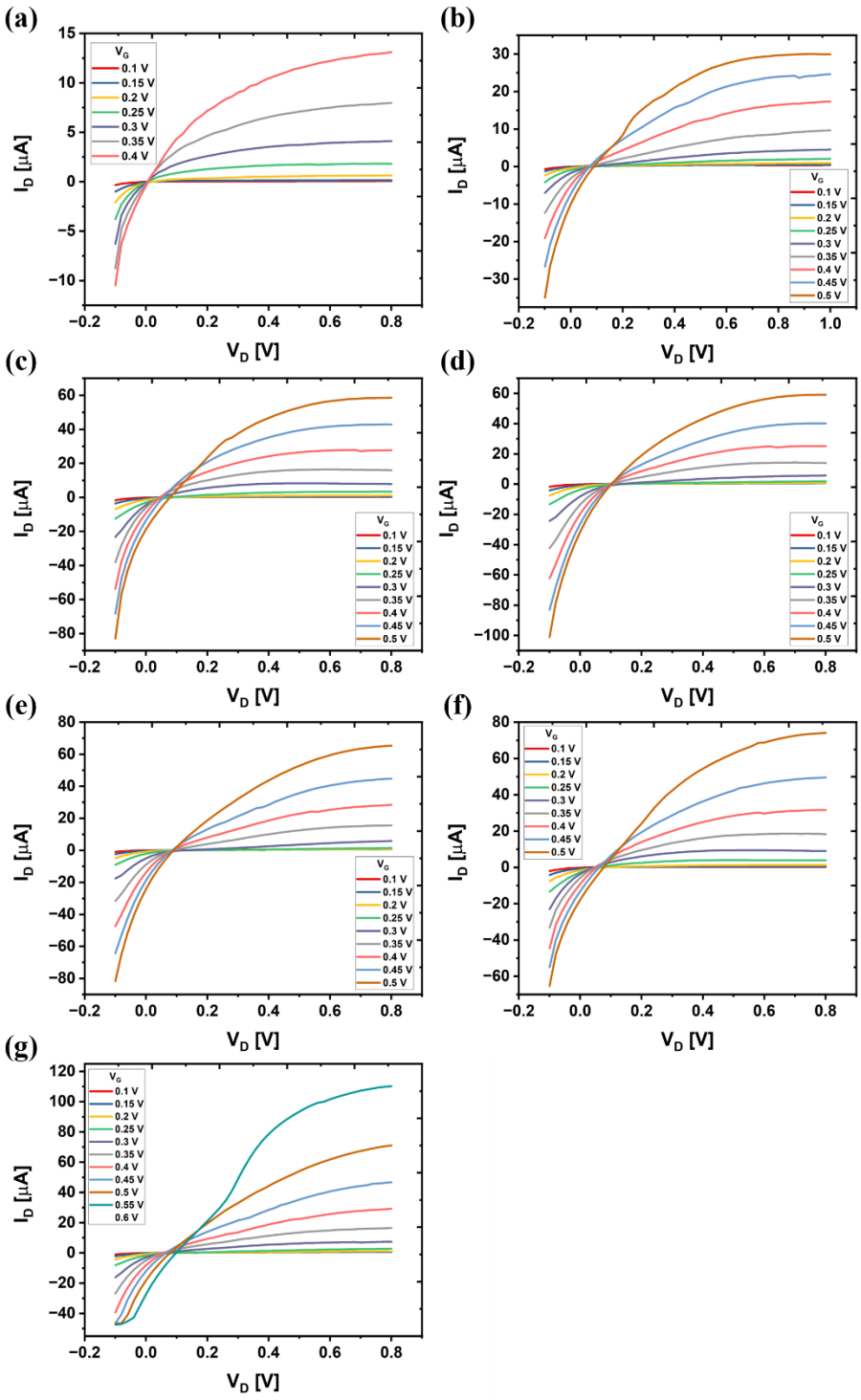

Figure S8. Output Characteristics of Multi-layer Drop-casted gNDI-Br_2 OECTs (50 mg mL^{-1}) Measured with a 100 mM NaCl Electrolyte and Ag/AgCl Gate Electrode with a Length (L) of 10 µm: (a) 1 layer, (b) 3 layers, (c) 5 layers, (d) 6 layers, (e) 7 layers, (f) 8 layers, and (g) 9 layers

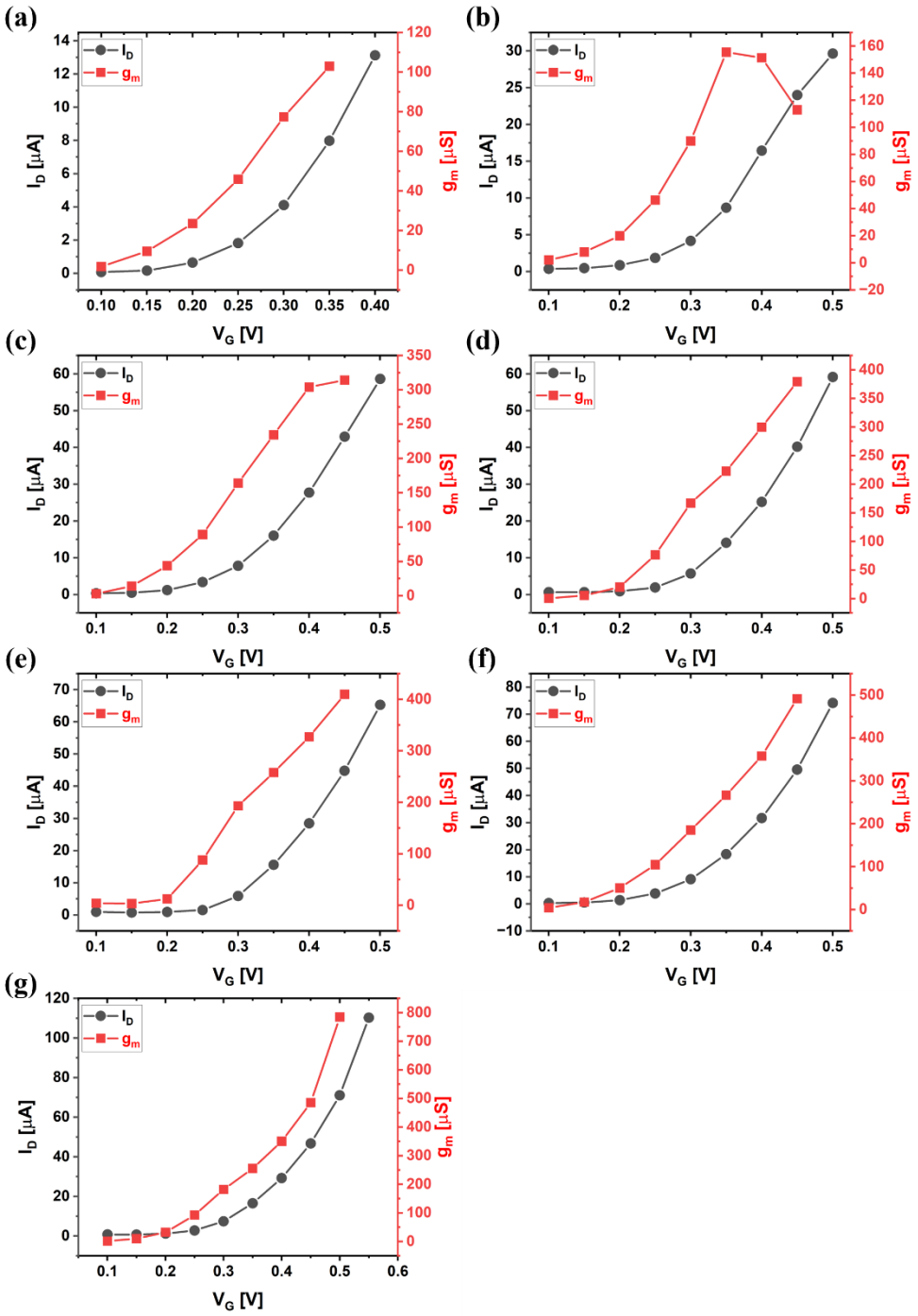

Figure S9. Transfer and Transconductance Curves of Multi-layer Drop-casted gNDI-Br_2 OECTs (50 mg mL^{-1}) Measured with a 100 mM NaCl Electrolyte and Ag/AgCl Gate Electrode with a Length (L) of 10 µm: (a) 1 layer, (b) 3 layers, (c) 5 layers, (d) 6 layers, (e) 7 layers, (f) 8 layers, and (g) 9 layers.

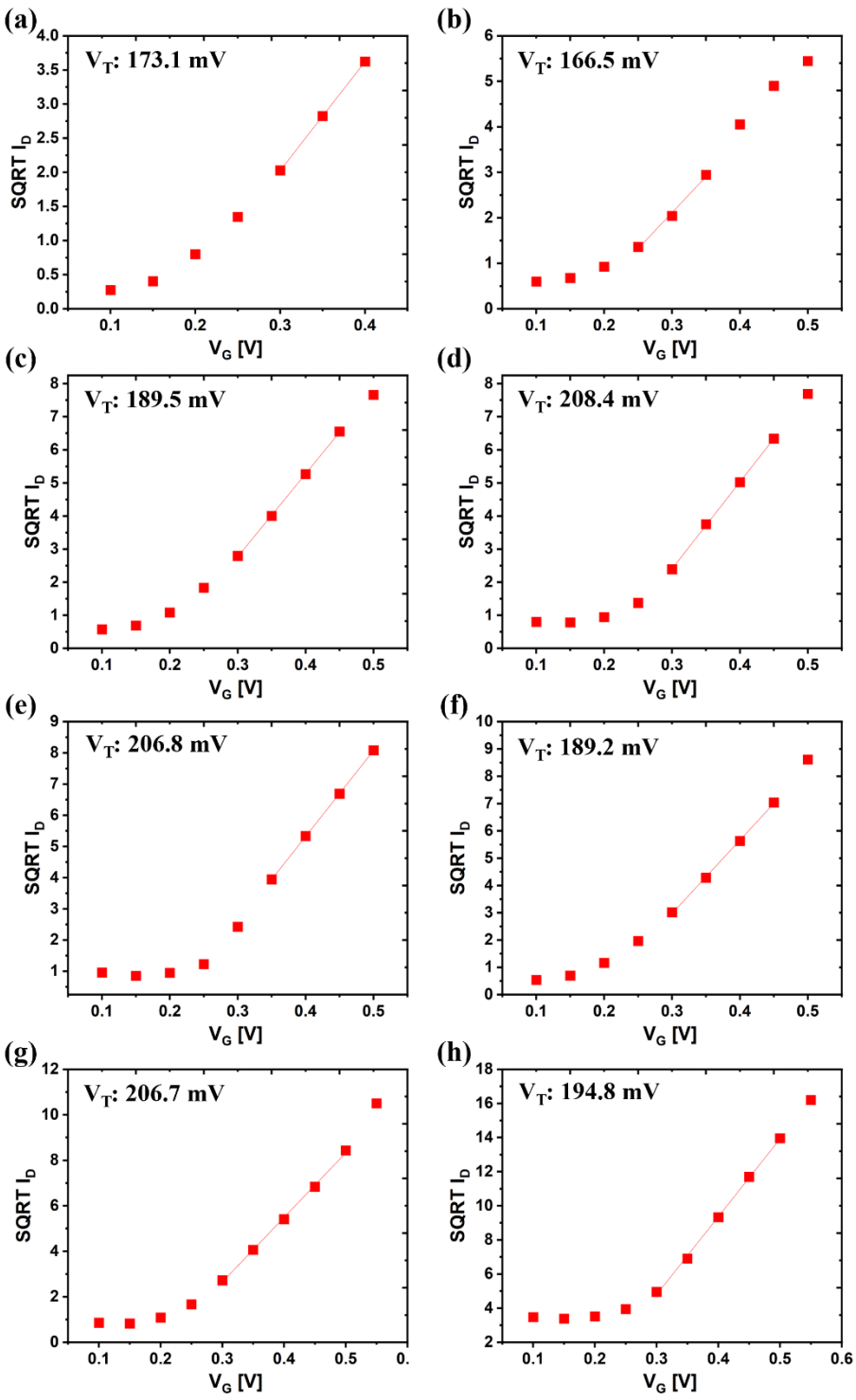

Figure S10. The sqrt (I_D) vs V_G curves of multi-layer drop-casted gNDI-Br_2 OECTs (50 mg mL^{-1}) with L of 10 µm: (a) 1 layer, (b) 3 layers, (c) 5 layers, (d) 6 layers, (e) 7 layers, (f) 8 layers, (g) 9 layers, and (h) 10 layers. All devices were measured with a 100 mM NaCl electrolyte and Ag/AgCl gate electrode.

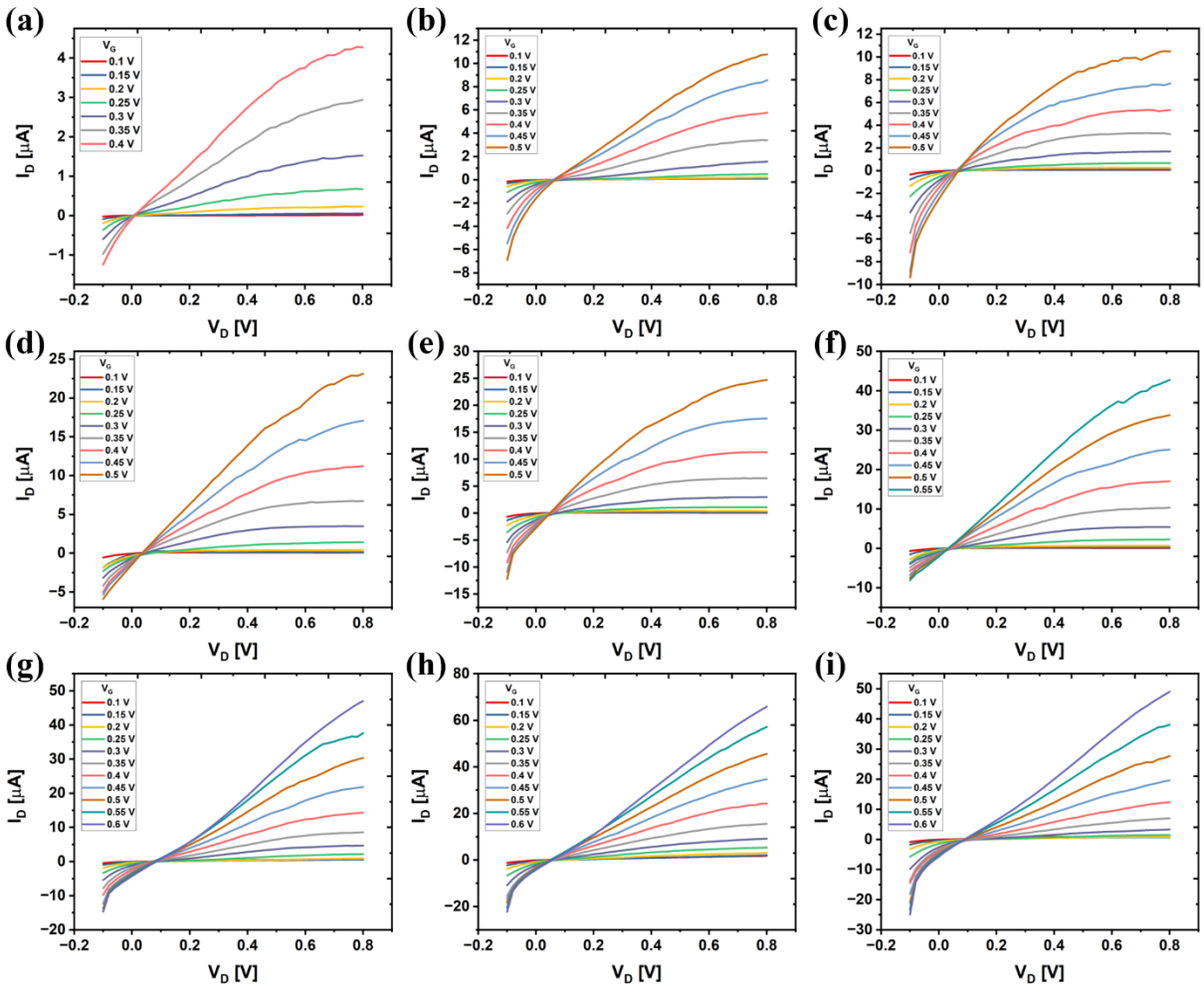

Figure S11. Output characteristics of multi-layer drop-casted gNDI-Br_2 OECTs (50 mg mL^{-1}) Measured with a 100 mM NaCl Electrolyte and Ag/AgCl Gate Electrode with a Length (L) of 20 µm: (a) 1 layer, (b) 2 layers, (c) 3 layers, (d) 4 layers, (e) 5 layers, (f) 6 layers, (g) 7 layers, (h) 8 layers, and (i) 9 layers.

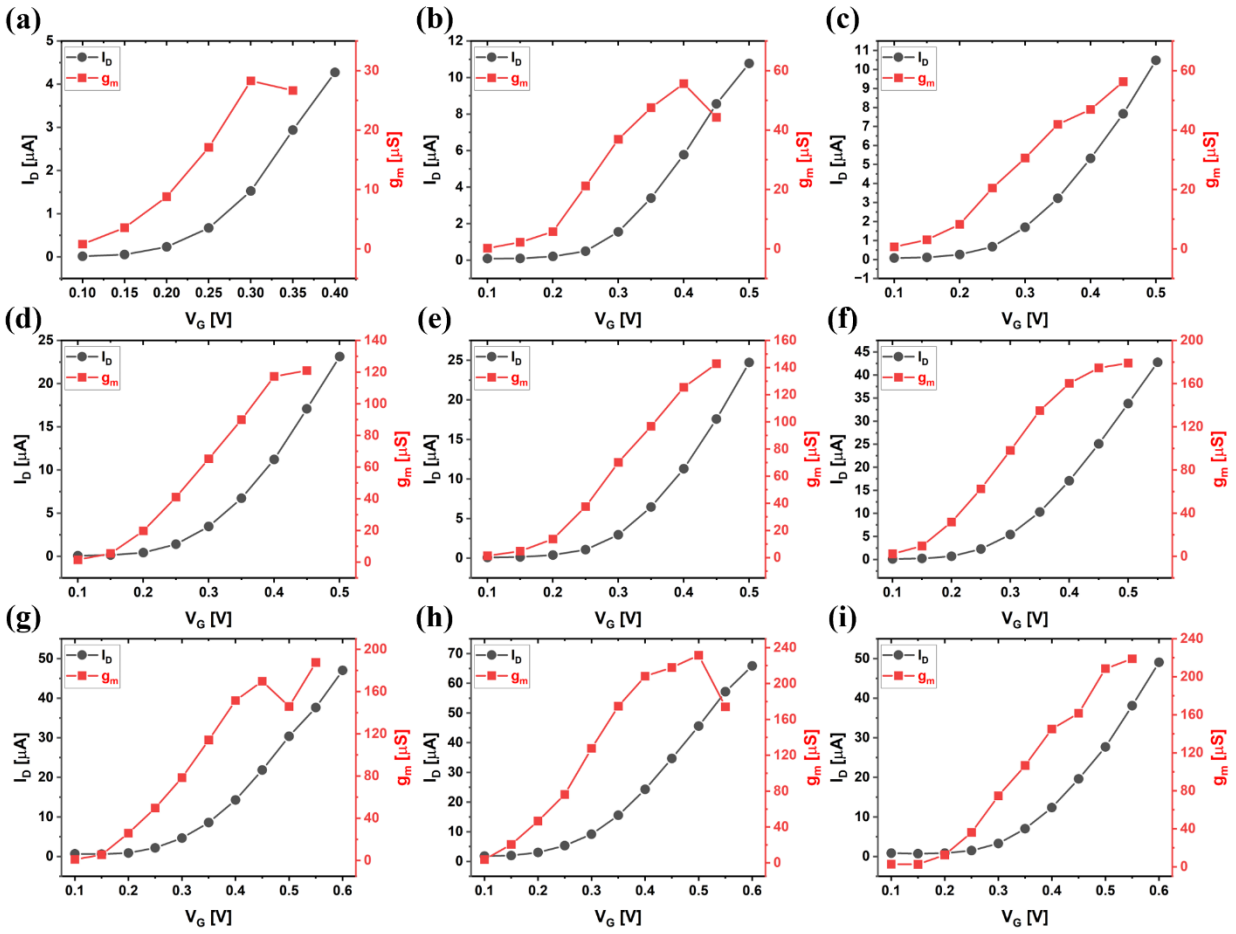

Figure S12. Transfer and Transconductance Curves of Multi-layer Drop-casted gNDI-Br_2 OECTs (50 mg mL^{-1}) Measured with a 100 mM NaCl Electrolyte and Ag/AgCl Gate Electrode with a Length (L) of 20 µm: (a) 1 layer, (b) 2 layers, (c) 3 layers, (d) 4 layers, (e) 5 layers, (f) 6 layers, (g) 7 layers, (h) 8 layers, and (i) 9 layers

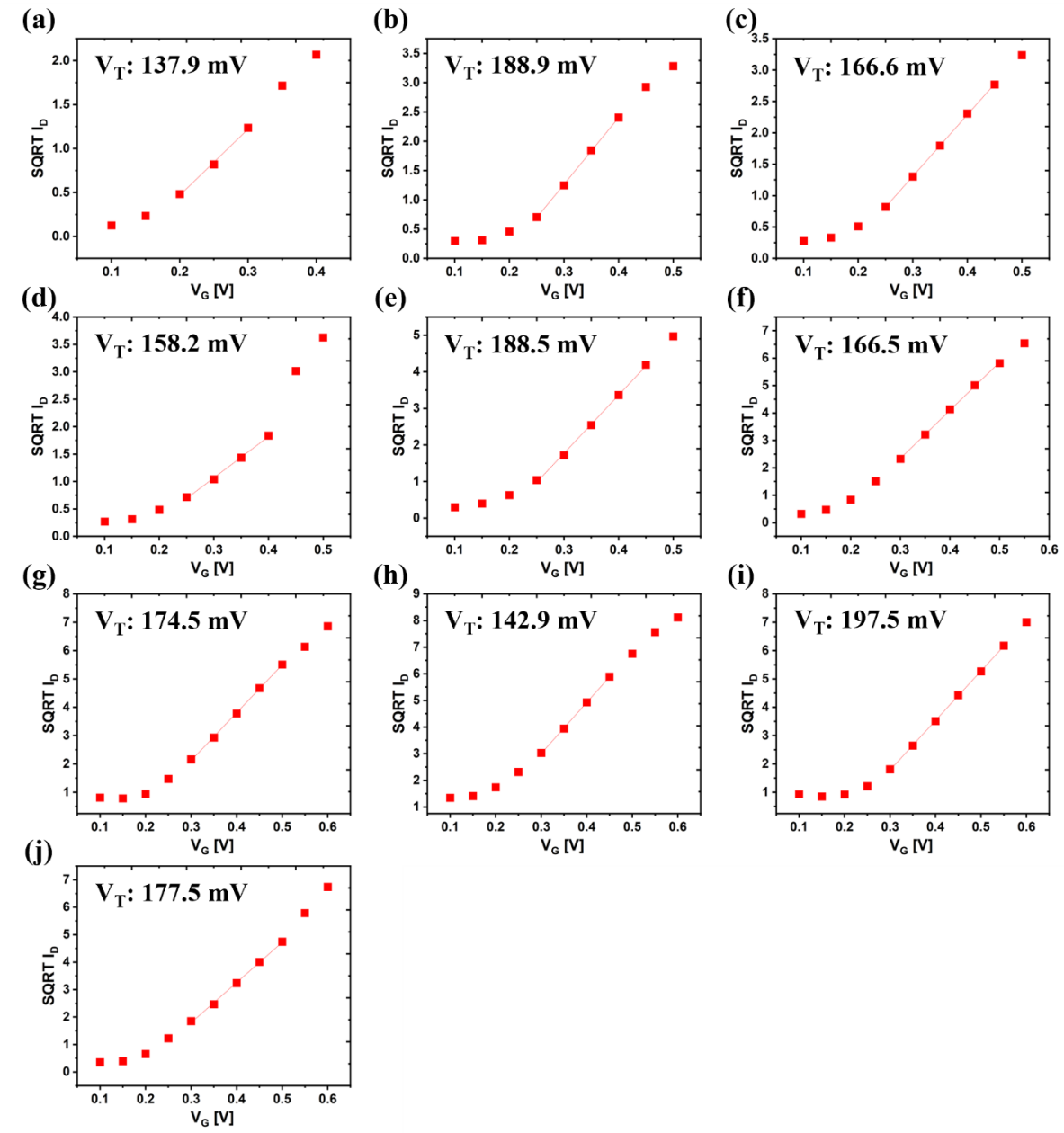

Figure S13. The sqrt (I_D) vs V_G Curves of Multi-layer Drop-casted gNDI-Br_2 OECTs (50 mg mL^{-1}), Measured with a 100 mM NaCl Electrolyte and Ag/AgCl Gate Electrode, Fabricated with a Length (L) of 20 µm: (a) 1 layer, (b) 2 layers, (c) 3 layers, (d) 4 layers, (e) 5 layers, (f) 6 layers, (g) 7 layers, (h) 8 layers, (i) 9 layers, and (j) 10 layers

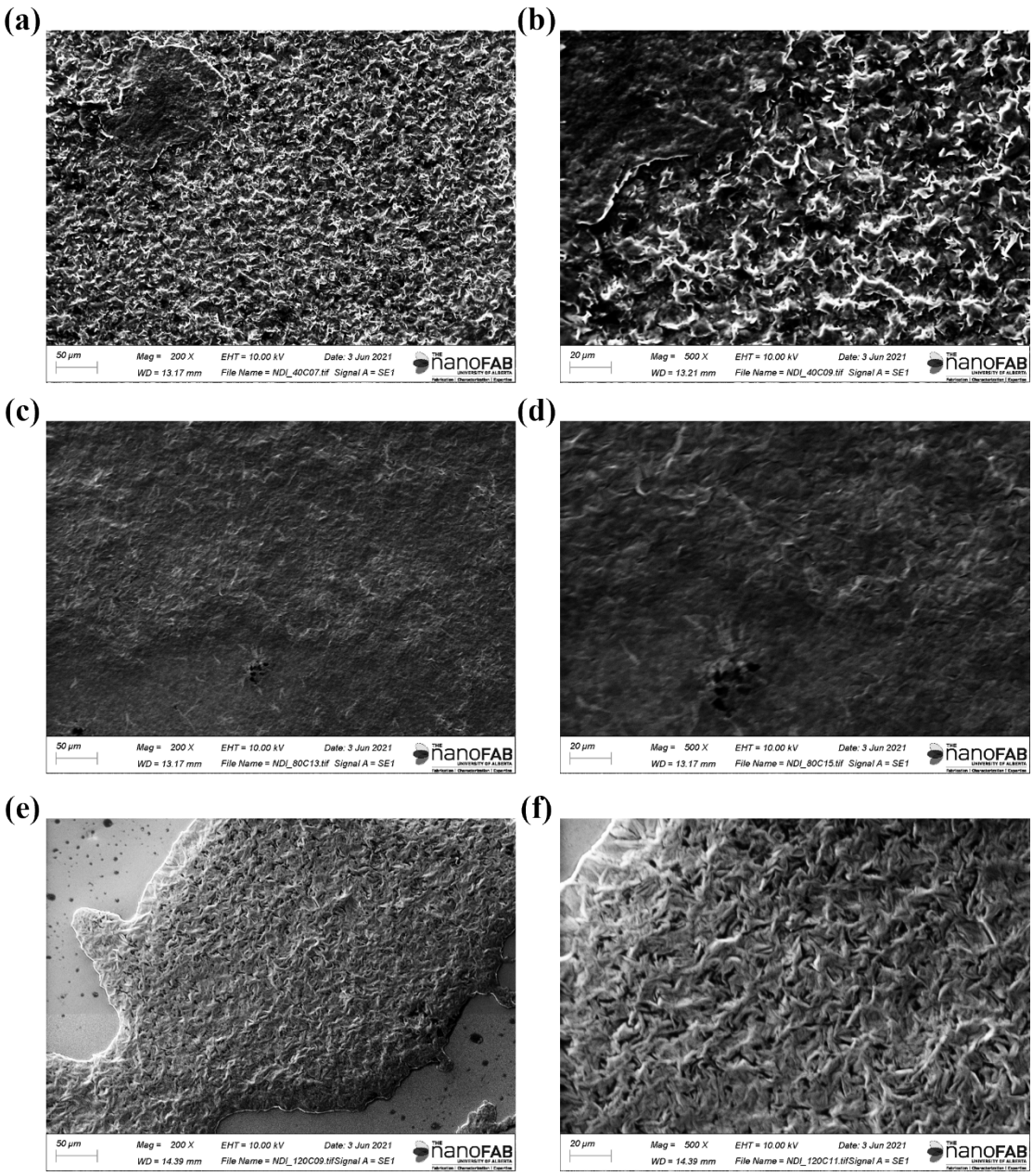

Figure S14. Scanning Electron Microscopy of Drop-casted gNDI-Br_2 (50 mg mL^{-1}) Thin Film onto Silicon Wafer: (a), (b) After Annealing at 40°C for 24 Hours, (c), (d) After Annealing at 80°C for 24 Hours, (e), (f) After Annealing at 120°C for 24 Hours.

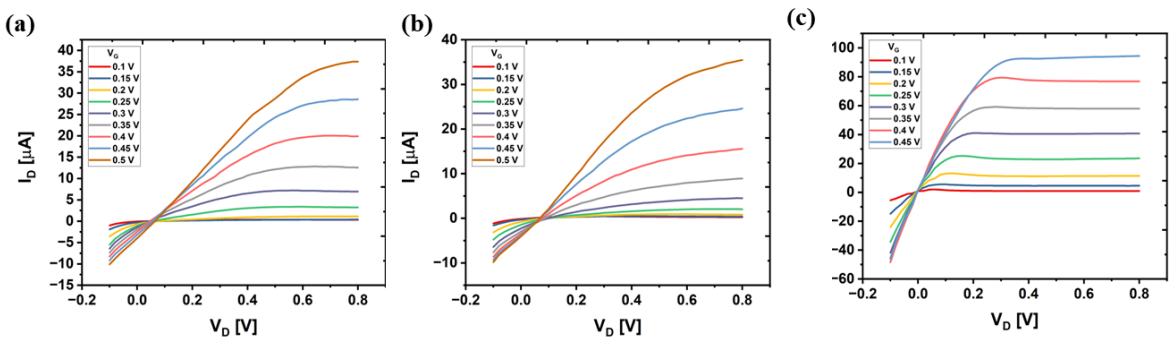

Figure S15.Output characteristics of OECTs fabricated on Si/SiO_2 substrates using 1-layer drop-casted 50 mg mL^{-1} gNDI-Br_2 solution with L = 10 μm and annealed at (a) 40°C, (b) 80°C, and (c) 120°C for 24 hours.

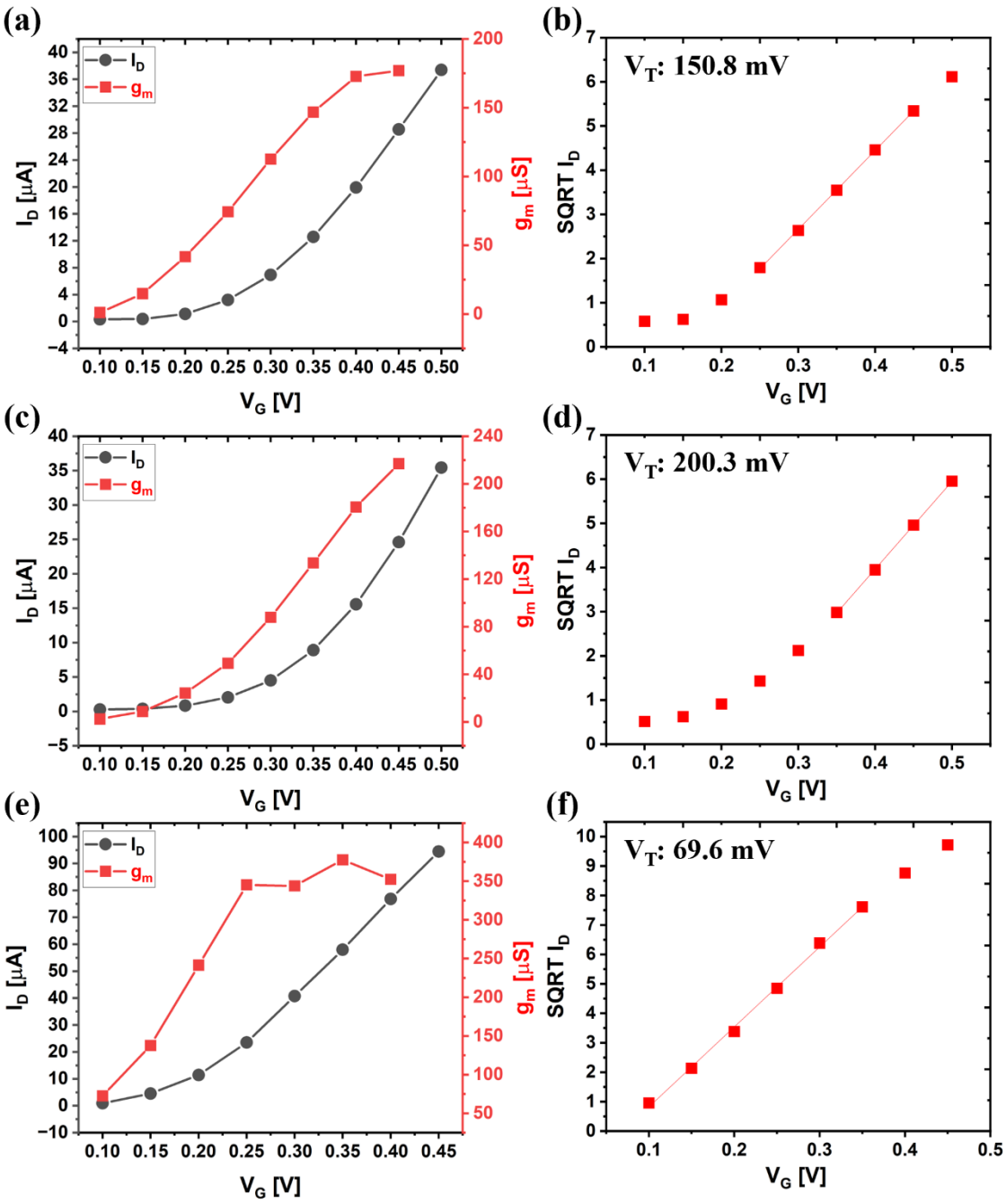

Figure S16. Transfer and Transconductance Curves of Drop-casted gNDI-Br_2 OECTs (50 mg mL^{-1}) Measured with a 100 mM NaCl Electrolyte and Ag/AgCl Gate Electrode with a Length (L) of 10 µm: Annealed at (a) 40°C, (c) 80°C, and (e) 120°C. The sqrt (I_D) vs V_G Curves of Drop-casted gNDI-Br_2 OECTs (50 mg/mL) Measured with a 100 mM NaCl Electrolyte and Ag/AgCl Gate Electrode with a L of 10 µm: Annealed at (b) 40°C, (d) 80°C, and (f) 120°C

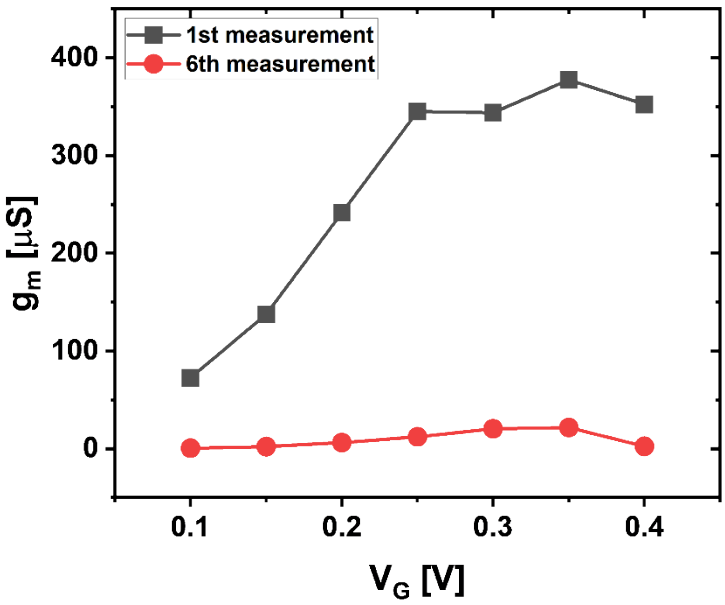

Figure S17. Transconductance curves of drop-casted gNDI-Br_2 OECT (50 mg mL^{-1}, L = 10 µm) annealed at 120°C measured with a 100 mM NaCl electrolyte and Ag/AgCl gate electrode calculated from the 1st and the 6th consecutive electrical measurements on the same device, showing a $g_{m,max}$ reduction from 337.5 µS to 31.7 µS.