



**Figure S1.** Specific contact resistance recorded at different temperature for a representative GaN/AlN/Al<sub>0.25</sub>Ga<sub>0.75</sub>N nanowire FET with Ti/Al/Ti/Au (20/80/20/30 nm) source-drain contacts using four-probe transport measurement. Inset: scanning electron microscopy image of GaN/AlN/AlGa<sub>0.25</sub>N nanowire device. Probes 1 & 4 were annealed in nitrogen at 800 °C for 30 s, while probe 2 & 3 are not annealed. During measurement, bias voltage was applied between probe 1 & 4, and then measured the voltage drop between probe 2 & 3. The average specific contact resistance of the nanowire is  $2.3 \times 10^{-5} \Omega \text{cm}^2$ , and it is ca. temperature independent. Scale bar is 1  $\mu\text{m}$ .