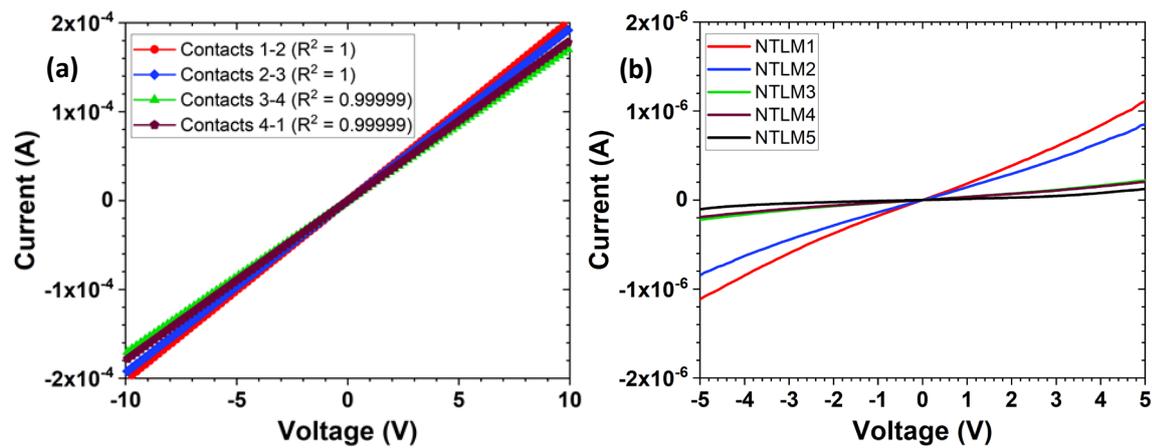
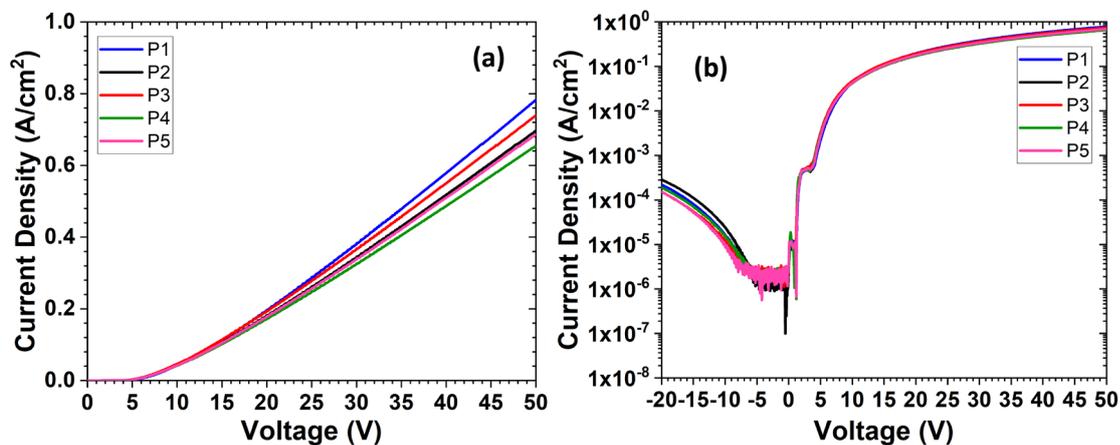


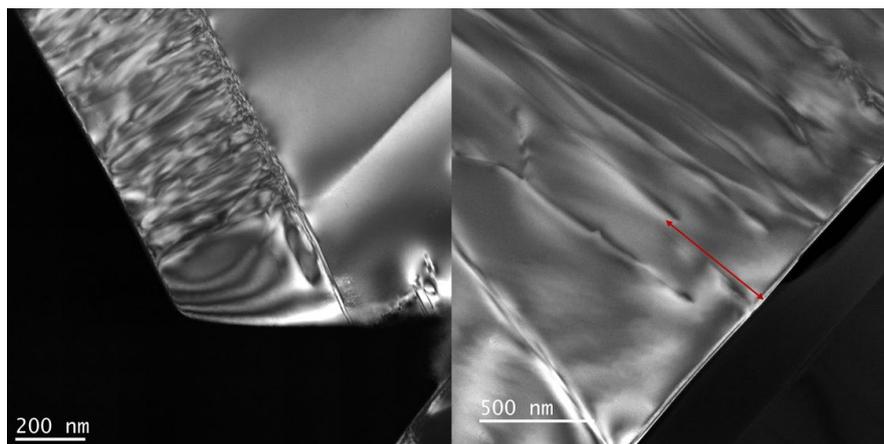
## Supplemental Document



**Figure 1:** Current-voltage characteristics (a) and n-contact transmission length measurements (NTLM) (b) of the Pt (10nm)/Pd (10 nm)/Au (100 nm) contacts on an annealed AlN:Si film.



**Figure 2:** (a) JV and (b) semilog JV characteristics of five equal dimension AlN homojunction PN diodes.



**Figure 3:** Dark-field TEM images ( $g = \langle 1 \ -1 \ 0 \ 0 \rangle$ ) of two AlN thin films with (right) and without (left) Al-assisted cleaning. The film without Al-assisted cleaning shows a clear interface that is littered with stacking faults between the film and substrate. The film with Al-assisted cleaning shows a uniform material with no clear interface. The expected interface position is indicated by the red arrow at a depth of approximately 530 nm as verified by profilometry.