Supplementary Figure S1. Alloy composition of uniform InGaN nanowires grown on silicon. Energy dispersive x-ray spectrum obtained from measurements on InGaN nanowires on silicon shown in the inset. We have grown InGaN nanowires of the same composition under identical growth conditions as the InGaN dots in the experimental samples reported in the manuscript, and have performed SEM-energy dispersive x-ray (EDX) measurements on these. From the data shown above, we derive an average In composition of ~23% (In$_{0.23}$Ga$_{0.77}$N).
Supplementary Figure S2. Radiative efficiency of InGaN quantum dot emission. Temperature dependent photoluminescence spectra of InGaN/GaN quantum dot in nanowire. The inset shows the peak intensity (QD peak) variation with incident power density. To determine the radiative efficiency of emission from the InGaN (QD) region we have performed an excitation dependent photoluminescence measurement at 10 K and 280 K. A radiative efficiency $\eta_r$ equal to 52% is estimated from the integrated photoluminescence intensity at these temperatures at an excitation of 80 KW/cm², at which a saturation of peak intensities is observed. It is assumed that non-radiative recombination centers are frozen at 10 K.
Supplementary Figure S3. Calculation of series resistance of GaN dot-in-nanowire p-n junction. Plot of forward current-voltage characteristics of InGaN dot-in-nanowire p-n junction. At low current levels, the junction voltage ($V_J$) makes up most of the voltage drop across the device ($V$). At higher current levels, the voltage drop across the series resistance ($I R_s$) becomes significant and voltage drop across the depletion region is reduced to $V_J = V - I R_s$. To determine the series resistance $R_s$, starting with a forward bias semilog plot, we extend the ideal-diode part of the plot to the slope-over region and calculate the $\Delta V$ voltage displacement between the two curves as a function of $I$. Since, $\Delta V = V - V_J = I R_s$, the slope of the line through a plot of $\Delta V$ versus $I$ yields the series resistance. Using this method, the measured series resistance is 2.38 GΩ at room temperature.