Electronic Supplementary Material (ESI) for Nanoscale.

Electronic Supporting Information

Graphene barristor using nitrogen profile controlled ZnO Schottky contacts

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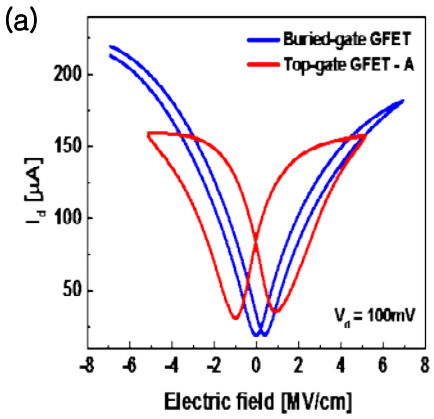

Fig. S1 Representative transfer characteristics comparing the buried gate GFET and top gate GFET.

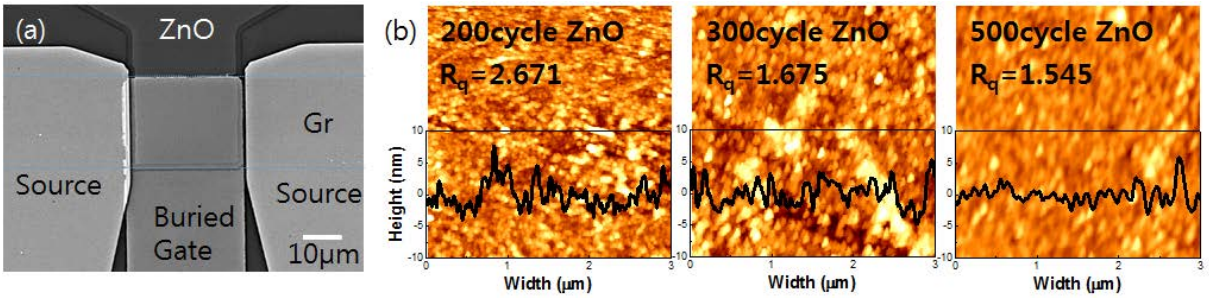

Fig. S2 (a) SEM image and (b) AFM tophology roughness of graphene-ZnO barristor device. ZnO is not contact with source electrode but graphene channel. Buried gate electrode only affect to graphene channel for control the barrier height on graphene-ZnO barristor. Surface roughness is very low on graphene channel.

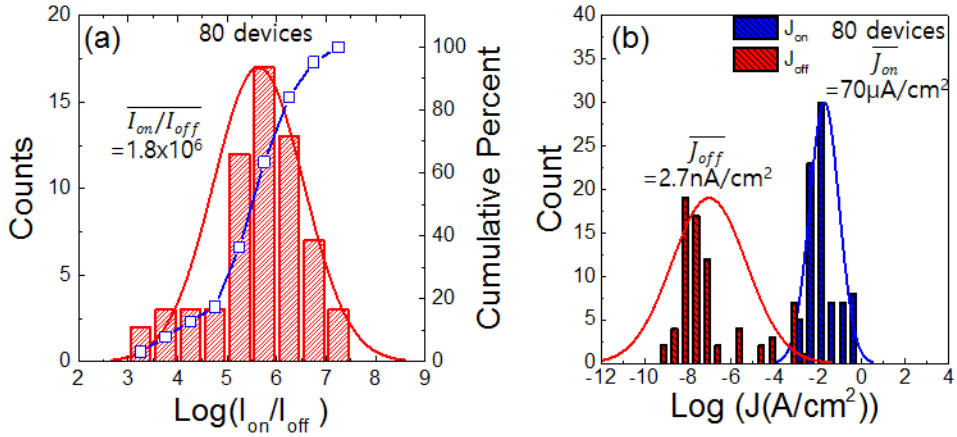

Fig. S3 On-off ratio and current density distribution of 80 devices of graphene/ZnO:N barristor (a)Log-normal distribution of on–off ratio(average on-off ratio is $1.8x10^6$) and standard deviation is 0.9. (b)Log-normal distribution of J_{on} and J_{off}. The average J_{on} and J_{off} is 2.7nA/cm^2 and 70μA/cm^2 and standard deviations are 1.7 and 0.68.

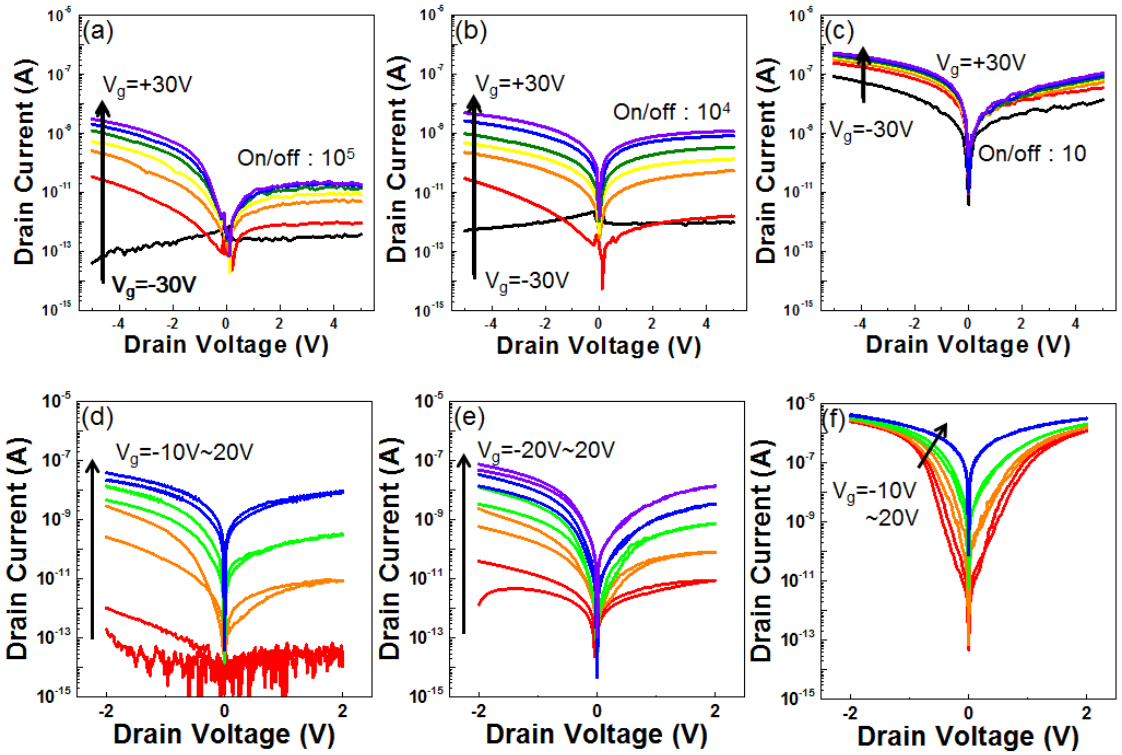

Fig. S4 I_d-V_d curve of variable ZnO:N stack in Graphene-ZnO:N barristor. (a) ZnO:N 200cycle, (b)ZnO:N 300cycle, (c)ZnO:N 500cycle, (d)ZnO:N 200cycle, (e)ZnO 70cycle/ZnO:N200cycle, (f)ZnO 150cycle/ZnO:N200cycle. Thicker film shows higher on current but it has low on/off ratio. From the ZnO/ZnO:N stack, saturation current is increased and on current also increased with lower drive voltage.