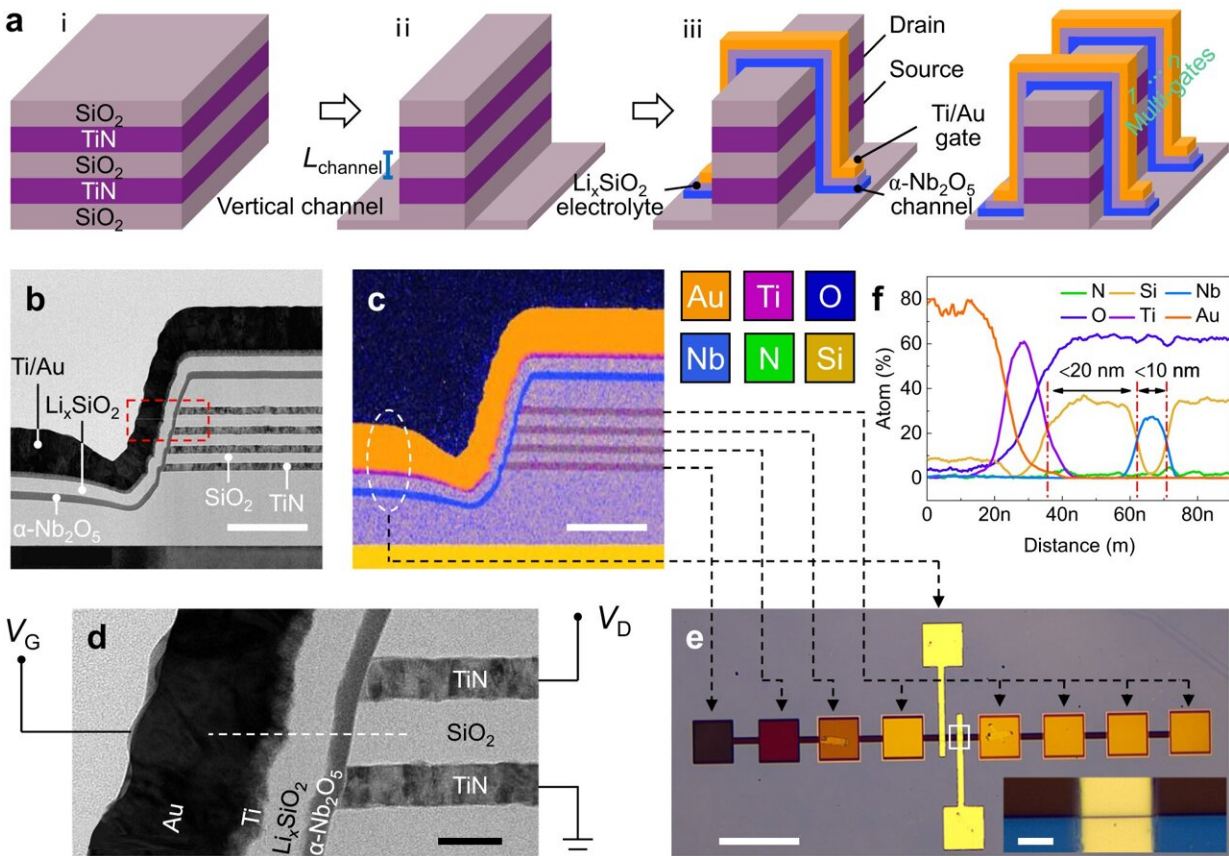


Low-power vertical neurotransistors emulate dendritic computing of neurons

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Device structure of V-EGT. Credit: *Nature Communications* (2023). DOI: 10.1038/s41467-023-42172-y

An important avenue for information processing, especially at the edge of limited resources, is to develop neuromorphic devices with functions

similar to biological neural networks.

In a study published in [*Nature Communications*](#), Prof. Shang Dashan's group at the Institute of Microelectronics of the Chinese Academy of Sciences (IMECAS) has developed a vertical dual-gate electrolyte-gated transistor, named a neurotransistor, with a 30 nm channel length, short-term memory characteristic and stackability for 3D integration. The read power and energy reach ~3.16 fW and ~30 fJ, which is close to a biological level.

The electrolyte-gated transistor uses electrolyte materials with mobile ions (such as H^+ , Li^+ , O^{2-}) as gate dielectric. The migration of ions driven by the gate voltage toward the channel produces multi-level short-term memory effects of the channel conductance, which is very similar to the dendritic behavior of neurons.

The researchers used the short-term memory characteristics of the neurotransistors to realize the [dendrite](#) computing function in biological neurons, such as dendrite integration and coincidence detection. The dendrite computing ability is extended to the recognition of sound azimuth and distance by integrating neurotransistors into a bionic sound localization [neural network](#).

This work not only demonstrates the potential of neurotransistors as [building blocks](#) to emulate the advanced functions of biological neural networks, but also provides a novel approach for the development of edge-oriented, high-density, low-energy neuromorphic computing hardware systems from a device level.

More information: Han Xu et al, A low-power vertical dual-gate neurotransistor with short-term memory for high energy-efficient neuromorphic computing, *Nature Communications* (2023). [DOI: 10.1038/s41467-023-42172-y](https://doi.org/10.1038/s41467-023-42172-y)

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