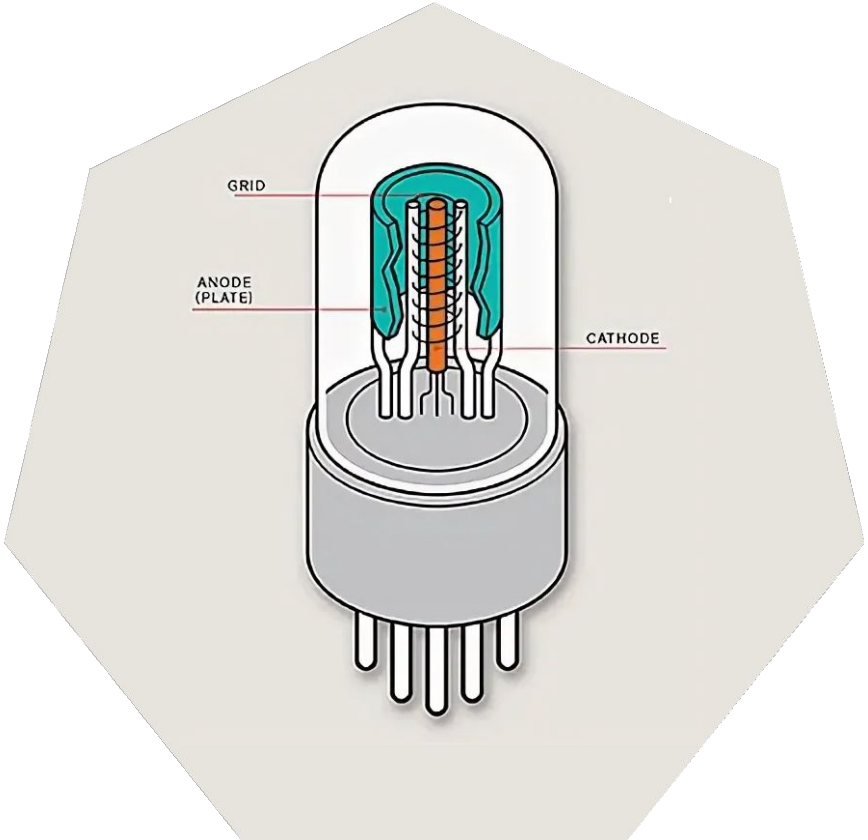
Vacuum transistors

Prepared by student Alice Sokovets

Vacuum transistors have absorbed the best of semiconductors and vacuum tubes

At the turn of the 60-70s, vacuum electron tubes were completely replaced by semiconductor transistors. However, their "funeral" turned out to be premature. Today we can safely talk about the creation of nanovacuum channel transistors — NVCT, which absorbed all the best from their predecessors.
Compared to conventional transistors, NVCTS work much faster. They are more resistant to high temperatures and radiation, which makes them indispensable for use in the technology of future space missions and in THz electronics. They will also be able to make "amendments" to the well-known Moore's Law, according to which the number of transistors in a computer chip cannot be unlimited..

As you know, vacuum tubes were quite bulky and consumed a huge amount of energy. NVCT transistors in this sense are "unpretentious" and can occupy only a few nanometers, so they can only be seen with an electronic scanning microscope.



It looks like the problem of energy consumption has been solved. Scientists from the NASA Research Center Jin Wu Han, Dong Moon and M. Meyappan have developed a silicon-based NVCT transistor with an improved gate design, which reduces the control voltage from several tens of volts to five.

In fact, the space inside the NVCT is not exactly a vacuum. It is filled with an inert gas (for example, helium at atmospheric pressure) in which electrons move. Since the distance between them does not exceed 50 nm, the probability of their collision with gas molecules is negligible, which allows the electrons to move almost unhindered, as in a real vacuum.

In the future, scientists plan to increase the performance of NCVT transistors, improve their reliability and extend their service life.

Reference

✔https://www.rlocman.ru/review/article.html?di=160932

✔https://www.techcult.ru/science/4146-vakuumnye-tranzistory

✔https://translated.turbopages.org/proxy_u/en-ru.ru.149a4fd3-626811e7-27abcfff-74722d776562/https/en.wikipedia.org/wiki/Nanoscale_vacuum-channel_transistor#History

✔http://ieee.tpu.ru/another/transistor.html