TRANSISTORS COULD STOP SHRINKING IN 2021

A key industry report forecasts an end to traditional scaling of transistors

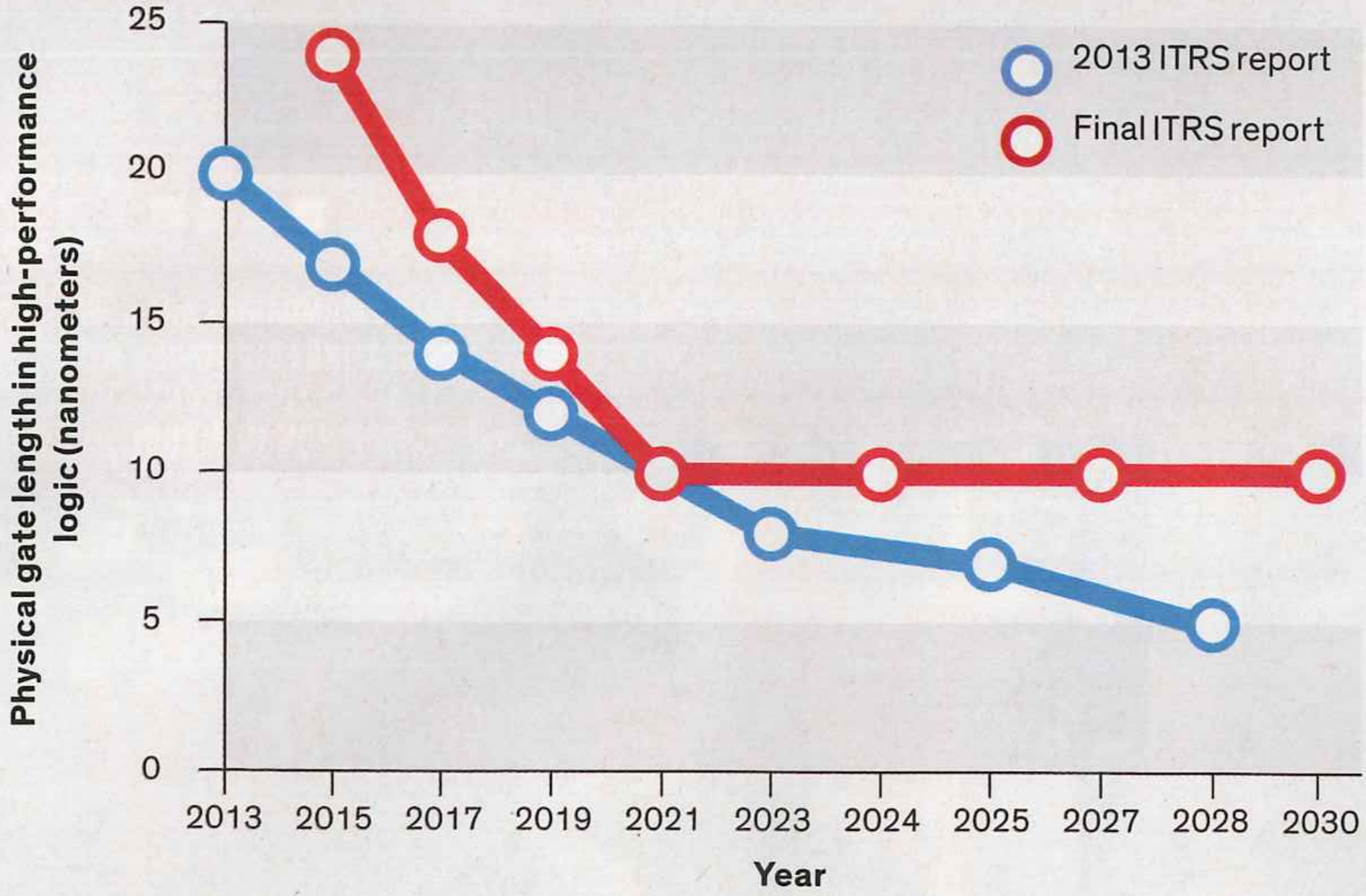
SMALLEST SO FAR: IBM made the first 7-nanometer-node test chips. There's little room to shrink further.

After more than 50 years of miniaturization, the transistor could stop shrinking in just five years. That is the prediction of the 2015 International Technology Roadmap for Semiconductors (ITRS), which was officially released in July.

After 2021, the report forecasts, it will no longer be economically desirable for companies to continue traditional transistor miniaturization in microprocessors. Instead, chip manufacturers will turn to other means of boosting density, namely turning the transistor geometry from horizontal to vertical and building multiple layers of circuitry, one on top of another.

For some, this change will likely be interpreted as another death knell for Moore's Law, the repeated doubling of transistor densities that has given us the extraordinarily capable computers we have today. Compounding the drama is that this is the last ever ITRS report, the end to a coordinated planning effort that began in the United States in 1993 and was then expanded to include the rest of the world.

Citing waning industry participation and an interest in pursuing other initiatives, the Semiconductor Industry Association—a U.S. trade group representing the interests of IBM, Intel, and other companies in Washington, D.C., and a key ITRS sponsor—will do its own work, in collaboration with »


Physical gate length in high-performance logic (nanometers)
25
20
15
10
5
0
2013
2015
2017
2019
2021
2023
2024
2025
2027
2028
2030
Year
2013 ITRS report
Final ITRS report

NEW GEOMETRY: Eventually, miniaturization may be supplanted by monolithic 3D integration, which would build layers of devices, such as the planar transistors shown here, atop one another, connected by dense wiring. Older technologies will continue to be used.