

Moore's Law predicted that transistor density would double every 2 years. Since smaller transistors switch faster, exponential increase in density would lead to exponential increase in speed.

But Moore's Law stopped being true. Since transistors consume power when they switch, increasing transistor density leads to increased power consumption. And high-power leads to high temperature, which makes Moore's Law impossible nowadays. First, air cooling (fans) can only remove so much heat. Second, voltage scaling reduces (dynamic) power consumption. But voltage cannot go too low to reduce power. This is because that voltage must stay above certain threshold voltage, otherwise there would easily be a noise problem in voltage. In addition, voltage scaling cannot prevent leakage power loss.