In 1965, Gordon Moore, one of the founders of Intel, observed that the number of transistors was doubling every 24 months and would continue to do so. For 40 years the chip industry managed to live up to that prediction.

The limitation to packing more transistors onto to a chip is a physical limitation called Dennard scaling– as transistors get smaller, their power density stays constant, so that the power use stays in proportion with area. This basic law of physics has created a “Power Wall” — a barrier to clock speed — that has limited microprocessor frequency to around 4 GHz since 2005. It’s why clock speeds on our microprocessor stopped increasing with leaps and bounds. And why memory density is not going to increase at the rate we saw a decade ago.

The Dynamic Power is defined by the following formula

**P = α \* CFV2**

α is percent of time switching

C is capacitance (related to size)

F is the clock frequency

V is voltage swing (from low to high)

Transistors consume power when they switch. Increasing transistor density leads to increased power consumption. The more power consumed, the more temperature emitted from the CPU. The current limitation is that the chips are accumulating too much temperature to continue being cooled with today’s air cold devices. Additionally - the power consumption provides a limitation as we move to more and more battery powered devices