

Moore's Law

Moore's Law is an empirical observation that number of transistors in an integrated circuit doubles every two years, leading to an exponential increase in computing power. It was made by Gordon Moore in 1965.

While Moore's Law held true for some period of time, it is now obvious that number of transistors on microchip is limited due to **physical limitations**.

- 1) **Energy Efficiency**: More transistors consume more power. Also as transistors become smaller and more densely packed, they can become less energy-efficient, leading to diminishing returns in terms of performance per watt.
- 2) The voltage must stay above **threshold voltage**. Otherwise, taking in the consideration the **voltage noise**, if we use small voltage, it is possible that a **signal could be read incorrectly**.
- 3) Limits of Voltage scaling: Voltage scaling might reduce the power consumed, but it **cannot prevent power losses**, meaning that the power consumption will still be high. **Leakage of power** grows as density of chips grows and insulators become thinner.
- 4) **Heat Dissipation**: As transistor density increases, so does power consumption and heat generation. Cooling these densely packed chips becomes increasingly challenging. High temperatures and limitations of cooling system can result in **chip melting**.
- 5) Other physical limitations that can lead to **manufacturing challenges**, **material limitations** etc.

