

Moore's law is the observation that the number of transistors in a dense integrated circuit doubles about every two years. This observation is no longer valid because of the limitations of packing more and more transistors onto a single board.

- Increasing transistor density leads to increased power consumption. High power leads to high temperature. Creative ways of keeping the transistors cool is becoming increasingly difficult.
- Also as the density of integrated circuits increase and transistors are packed closer together, current leakages between circuits becomes a problem.
- Dennard Scaling is a technic for keeping the power consumption and temperature low while at the same time increasing the clock speed.

Power consumption, clock speed and voltage are related via the following equation.

$$P = \alpha * CFV^2$$

where

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)

Dennard scaling eventually breaks down because as the clock frequency goes up you must decrease the voltage swings to maintain the same power consumption. But if the voltage goes to low the signal to noise ratio becomes a problem. It becomes harder to distinguish between what is a signal and what in noise.