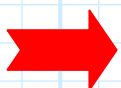# Delay-Power Product

Q: *So, an ideal digital technology would have BOTH very small propagation delay t_p, AND very small power dissipation P_D, right ?*

A: True ! But, there is a problem. Designing a "faster" (e.g., lower t_p) digital gate usually requires **greater power**. And designing a gate to minimize power consumption usually **slows down** the digital device.

Propagation delay and power dissipation generally form a **design trade off** - improve one and you degrade the other !

To quantify how effective, or efficient a digital design technology is in terms of delay and power, we use the product of the **propagation delay** and the **power dissipation**:

The **delay-power product** (DP) !

The delay-power product is therefore **defined** as:

$$DP = P_D \ t_p$$

*   Note we could define either a **static or dynamic** delay-power product, depending on P_D.

*   Note also the **unit** of the delay-power product—**Joules** !!

The delay-power product is a **figure of merit** for digital technologies.