

Diode Behaviour

Electrical Engineering

The exponential law, the 0.7 V model, and when each one is honest.

A diode conducts exponentially in forward bias and blocks almost everything in reverse.

$$I = I_S (\exp(V/nV_T) - 1) \cdot V_T \approx 25.9 \text{ mV at } 300 \text{ K}$$

Silicon at 10 mA

Constant drop.

$\approx 0.7 \text{ V forward}$

Schottky at 10 mA

Faster too.

$\approx 0.3 \text{ V forward}$

Ten times the current

For $n \approx 1$.

About 60 mV more

THE COMMON MISTAKE

- ✗ **Paralleling diodes to share a large current**
- ✓ **Giving each one its own small series resistor**

The exponential law means the diode with the lowest forward voltage takes nearly all the current and overheats first.

Forward voltage falls roughly 2 mV per degree, so a hot diode conducts harder. That is the thermal runaway mechanism.