

Power flow

$$\text{DC Power} = VI$$

$$P(t) = V(t) \times I(t)$$

↑
Instantaneous Power

Instantaneous

a Circuit Power (in watt) is the power absorbed by component at any instant in time.

$$V(t) = V_{\max} \cos(\omega t + \Theta_v)$$

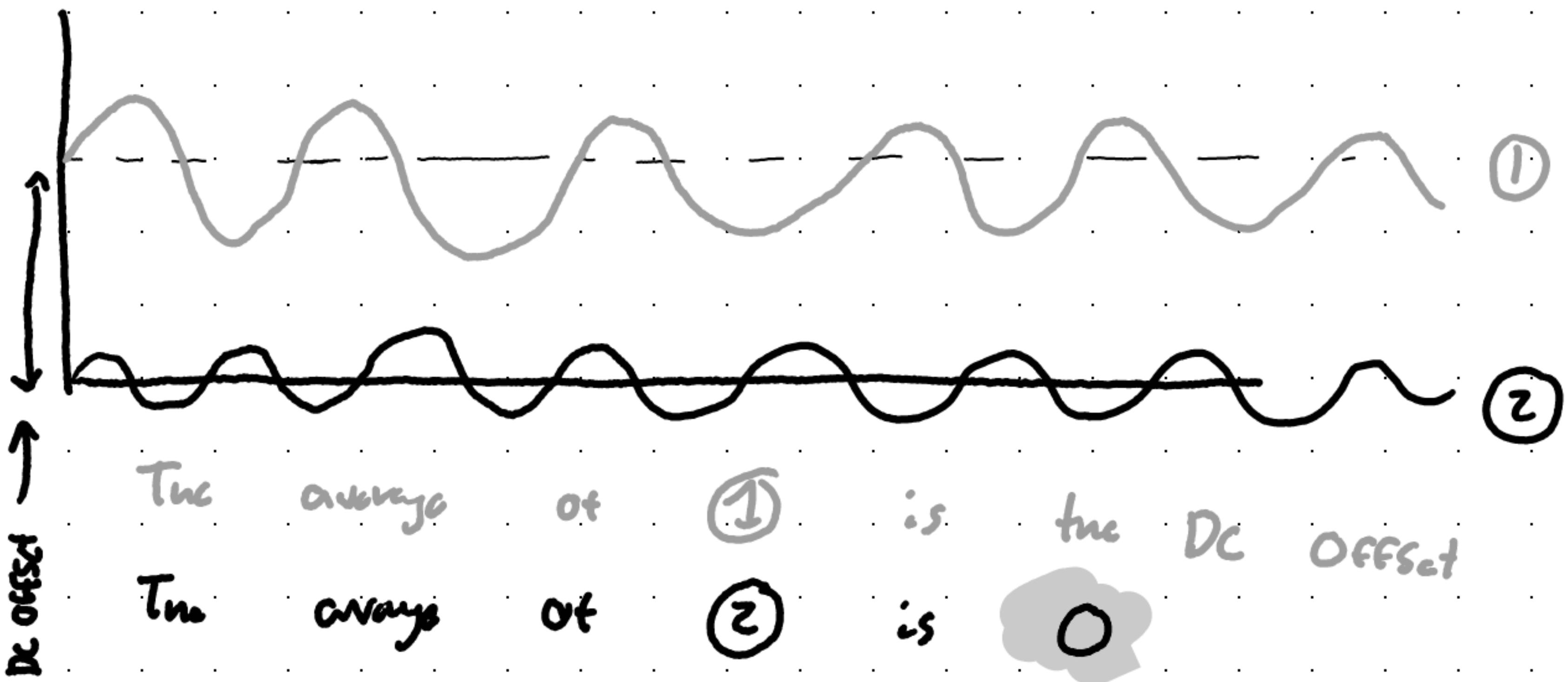
$$i(t) = I_{\max} \cos(\omega t + \Theta_i)$$

So

$$P(t) = \frac{1}{2} V_m I_m \cos(\Theta_v - \Theta_i) + \frac{1}{2} V_m I_m \cos(2\omega t + \Theta_v + \Theta_i)$$

- Positive Values of power indicates times when power is being absorbed by the circuit.

- Negative Values of power indicates times when power is generated by the circuit.



The most common power measurement is that of
Average Power

$$P_{rms} = V_{rms} I_{rms}$$

$$\text{Average Power} = \frac{1}{2} V_m I_m \cos(\theta_v - \theta_i) = \frac{1}{2} \operatorname{Re}(V I^*)$$

Flux sign

Case 1: purely resistive load (voltage and current are in phase)

$$P = \frac{1}{2} V_m I_m = \frac{1}{2} I^2 R$$

Case 2: Inductive or capacitive load

$$P = \frac{1}{2} V_m I_m \cos(\theta_0) = 0$$