

Class 18: AC Power

- Instantaneous power from the time signal $p(t) = v(t)i(t)$
- Complex power: $S = VI^* = |S|\angle\theta_s = P + jQ$ Don't forget the conjugate!! (*)
- Average power or active power or real power: $\text{Re}[S] = P = |S| \cos \theta_s$
 - This is what's normally thought of as "power". Units are W.
 - It's also what you get if you take the average value of the instantaneous power
- Reactive power: $\text{Im}[S] = Q = |S| \sin \theta_s$ Units are "var".
- Apparent power: $|S| = |V| \cdot |I|$ Units are "VA".
- Power factor angle: θ_s is the angle of S or $\theta_v - \theta_i$
- Power factor: $\cos(\theta_s) = P/|S|$. It must be indicated as "leading" (negative θ_s) or "lagging" (positive θ_s). A unity (1) power factor indicates zero reactive power and is neither leading nor lagging.

Example 1

Calculate for the voltage source

1. Current I
2. Complex power S
3. Active power P
4. Reactive power Q
5. Apparent power $|S|$
6. Power factor angle θ_s
7. Power factor

