

Drude

Sommerfeld

$$\sigma = \frac{ne^2}{m} \tau = \frac{ne^2}{m} \underbrace{l}_{v_0}$$

$$\propto \sqrt{\frac{k_B T}{m}} \quad \frac{\hbar k_F}{m}$$

$$\sigma \propto \frac{1}{\sqrt{T}}$$

$$\kappa = \frac{1}{3} v_0^2 c_v \tau = \frac{1}{3} \underbrace{v_0}_{\frac{3}{2} n k_B} \underbrace{c_v}_{\frac{\pi^2}{2} \left(\frac{k_B T}{\epsilon_F} \right) n k_B} l$$

$$\kappa \propto \sqrt{T} T$$

$$\frac{\kappa}{\sigma} \propto T$$