Zustandsdichte für freie Teilchen mit $\epsilon(\vec{k}) = \frac{\hbar^2 \vec{k}^2}{2m}$

$$\mathcal{N}(\epsilon) = \frac{1}{V} \sum_{\vec{k}} \delta(\epsilon - \epsilon(\vec{k})) \text{ mit } \frac{1}{L^d} \sum_{\vec{k}} \xrightarrow{L \to \infty} \int \frac{d^d k}{(2\pi)^d}$$

$$\mathcal{N}(\epsilon) = \int_{-\infty}^{\infty} \frac{d^d k}{(2\pi)^d} \delta(\epsilon - \epsilon(\vec{k}))$$

$$\boxed{\begin{aligned} d = 1: &\quad \mathcal{N}(\epsilon) = 2\frac{\sqrt{2m}}{2\pi\hbar} \epsilon^{-\frac{1}{2}}(\vec{k}) \sim \frac{1}{\sqrt{\epsilon}} \\ d = 2: &\quad \mathcal{N}(\epsilon) = \frac{m}{\pi\hbar^2} = \text{const} \\ d = 3: &\quad \mathcal{N}(\epsilon) = \frac{1}{2\pi^2} \left(\frac{2m}{\hbar^2}\right)^{\frac{3}{2}} \sqrt{\epsilon(\vec{k})} \sim \sqrt{\epsilon} \end{aligned}}$$