NOTE ON NOTATION

The electron distribution function technically has units of (VELOCITY)$^{-3}$ or (eV)$^{-3/2}$. This results from the normalization

$$\int f(\vec{v})\, d^3V = 1$$

When this is translated to an energy representation, then we have

$$\int f(\varepsilon)\ \underbrace{\varepsilon^{1/2} d\varepsilon}_{\substack{\text{Differential} \\ \text{corresponding to } d^3V}} = 1$$

where f(ε) retains the normalization of (eV)$^{-3/2}$. Now people will very often lump the $\varepsilon^{1/2}$ into the distribution function

$$\int \bar{f}(\varepsilon)\, d\varepsilon = 1$$

so that $\bar{f}(\varepsilon) = f(\varepsilon)\,\varepsilon^{1/2}$ which has units of (eV)$^{-1}$. The units of f(ε) tell you which normalization is used. Also $\bar{f}(\varepsilon)$ (eV^{-1}) is always zero at ε = 0 whereas f(ε) eV$^{-3/2}$ is not (it is finite at zero)