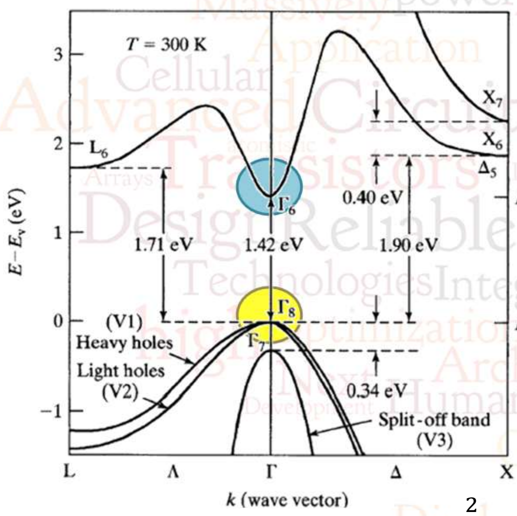
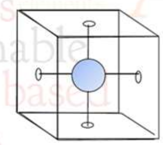
Density of States (GaAs)



$$m_h^* = \left[(m_{h,HH}^*)^{\frac{3}{2}} + (m_{h,LH}^*)^{\frac{3}{2}}\right]^{\frac{2}{3}}$$

- Both Conduction & Valence band structures are approximately spherical
- Electrons within the CB are characterized by a single isotropic effective mass

$$g_C(E)_{3D} = \frac{1}{2\pi^2}\left(\frac{2m_e^*}{\hbar^2}\right)^{\frac{3}{2}}(E - E_C)^{\frac{1}{2}}$$



- Electrons within the VB are in two separate bands, i.e. in two k = 0 degenerate sub-bands
- SO band is neglected

$$g_V(E)_{3D} = \begin{cases} \dfrac{1}{2\pi^2}\left(\dfrac{2m_{h,HH}^*}{\hbar^2}\right)^{\frac{3}{2}}(E_V - E)^{\frac{1}{2}} = g_V(E)_{HH} \\ \dfrac{1}{2\pi^2}\left(\dfrac{2m_{h,LH}^*}{\hbar^2}\right)^{\frac{3}{2}}(E_V - E)^{\frac{1}{2}} = g_V(E)_{LH} \end{cases}$$

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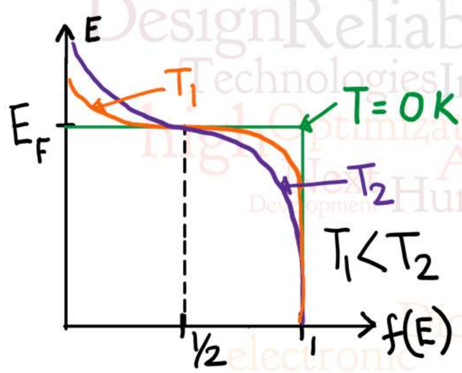
Fermi function

$$f(E) = \frac{1}{1 + e^{\frac{E - E_F}{kT}}}$$

$$f(E_F) = \frac{1}{2}$$

- The function $f(E)$, the *Fermi–Dirac distribution function,* gives the probability that an available energy state at E will be occupied by an electron at absolute temperature T.
- An energy state at the Fermi level has a probability of 1/2 of being occupied by an electron



- The Fermi function is symmetrical about E_F for all temperatures
- At conditions, $E \sim E_F \gg kT$, FD distribution can be approximated by using the MB distribution.

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