The Temperature Dependence of Carrier Concentration

18.32 In order to estimate the electrical conductivity of intrinsic silicon at 80°C, we must employ Equation 18.15. However, before this is possible, it is necessary to determine values for n_i , μ_e , and μ_h . According to Figure 18.16, at 80°C (353 K), $n_i = 1.5 \times 10^{18} \text{ m}^{-3}$, whereas from the "<10²⁰ m⁻³" curves of Figures 18.19a and 18.19b, at 80°C (353 K), $\mu_e = 0.10 \text{ m}^2/\text{V-s}$ and $\mu_h = 0.035 \text{ m}^2/\text{V-s}$ (realizing that the mobility axes of these two plot are scaled logarithmically). Thus, the conductivity at 80°C is

> $\sigma = n_i |e| (\mu_e + \mu_h)$ $\sigma = (1.5 \times 10^{18} \text{ m}^{-3}) (1.602 \times 10^{-19} \text{ C}) (0.10 \text{ m}^2/\text{V-s} + 0.035 \text{ m}^2/\text{V-s})$

> > $= 0.032 (\Omega - m)^{-1}$

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