Example 2.3 Calculate the number of states per unit energy in a 100 by 100 by 10 nm piece of silicon ($m^* = 1.08\ m_0$) 100 meV above the conduction band edge. Write the result in units of eV^{-1}.

Solution The density of states equals:

$$g(E) = \frac{8p\sqrt{2}}{h^3} m^{*3/2} \sqrt{E - E_c}$$

$$= \frac{8p\sqrt{2}\,(1.08 \times 9.1 \times 10^{-31})^{3/2}}{(6.626 \times 10^{-34})^3} \sqrt{0.1 \times 1.6 \times 10^{-19}}$$

$$= 1.51 \times 10^{56}\ \mathrm{m^{-3}J^{-1}}$$

So that the total number of states per unit energy equals:

$$g(E)V = 1.51 \times 10^{56} \times 10^{-22}\ \mathrm{J^{-1}} = 2.41 \times 10^{5}\ \mathrm{eV^{-1}}$$