Table 3.2 Si solar cell model parameters

Parameter	Value
A	100 cm^2
W_N	0.35 μm
N_D	1×10^{20} cm^{-3}
D_p	1.5 cm^2/V-s
$S_{F,\text{eff}}$	3×10^4 cm/s
τ_p	1 μs
L_p	12 μm
W_P	300 μm
N_A	1×10^{15} cm^{-3}
D_n	35 cm^2/V-s
S_{BSF}	100 cm/s
τ_n	350 μs
L_n	1100 μm

power point is found by solving

$$\left.\frac{\partial P}{\partial V}\right|_{V=V_{MP}} = \left.\frac{\partial (IV)}{\partial V}\right|_{V=V_{MP}} = \left.\left[I + V\frac{\partial I}{\partial V}\right]\right|_{V=V_{MP}} = 0 \tag{3.132}$$

for $V = V_{MP}$. The current at the maximum power point, I_{MP}, is then found by evaluating equation (3.130) at $V = V_{MP}$.

The rectangle-defined V_{OC} and I_{SC} provides a convenient means for characterizing the maximum power point. The fill factor, FF, is a measure of the *squareness* of the $I-V$ characteristic and is always less than one. It is the ratio of the areas of the two rectangles shown in Figure 3.16 or

$$FF = \frac{P_{MP}}{V_{OC} I_{SC}} = \frac{V_{MP} I_{MP}}{V_{OC} I_{SC}} \tag{3.133}$$

An empirical expression for the fill factor is [15]

$$FF = \frac{V_{OC} - \dfrac{kT}{q}\ln[qV_{OC}/kT + 0.72]}{V_{OC} + kT/q}. \tag{3.134}$$

Arguably, the most important figure of merit for a solar cell is its power conversion efficiency, η, which is defined as

$$\eta = \frac{P_{MP}}{P_{in}} = \frac{FF V_{OC} I_{SC}}{P_{in}} \tag{3.135}$$

The incident power, P_{in}, is determined by the properties of the light spectrum incident upon the solar cell. Further information regarding experimental determination of these parameters appears in Chapter 16.