where G and U are the generation and recombination rates, which may be different for electrons and holes if there are transitions into or from localised states.

5. CARRIER MOBILITY

In weak fields, the drift mobilities in Equations (5) represent the ratio between the mean carrier velocity and the electric field. The mobilities—which are generally different for majority and minority carriers—depend on the concentration of charged impurities and on the temperature. For silicon, these empirical dependencies are generally expressed in the Caughey–Thomas form [15]:

$$\mu = \mu_{min} + \frac{\mu_0}{\left(\frac{N}{N_{ref}}\right)^{\alpha}} \tag{12}$$

The values of the various constants for majority and minority carriers are given in Tables 7 and 8. A full model that includes the effects of lattice scattering, impurity scattering, carrier–carrier scattering, and impurity clustering effects at

TABLE 7 The Values of Parameters in Equation (12) for Majority-Carrier Mobility in Silicon (from Reference [17]; $T_n = T/300$)

	$\mu_{min} = AT_n^{-\beta}$		$\mu_0 = BT^{-\beta 2}$		$N_{ref} = CT_n^{\beta 3}$		$\alpha = DT_n^{-\beta 4}$	
	A	β_1	B	β_2	C	β_3	D	β_4
Electrons	88		7.4×10^{8}		1.26×10^{17}			
Holes	54.3	0.57	1.36×10^{8}	2.33	2.35×10^{17}	2.4	0.88	0.146

TABLE 8 The Values of Parameters in Equation (12) for Minority-Carrier Mobility in Silicon

	μ_{min}	μ_0	N_{ref}	α
Electrons	232	1180	8×10^{16}	0.9
Holes	130	370	8×10^{17}	1.25

(from references [18,19])