

Analytical derivation of equivalent functional form of explicit J-V model of an illuminated solar cell from physics based implicit model

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Abstract

Recently a simple explicit model was introduced to represent the J - V characteristics of an illuminated solar cell with parasitic resistances and bias dependent photocurrent as $j = (1 - v^m)/(1 + \alpha v)$, here the normalized voltage, v and normalized current density j can be represented as $v = V/V_{oc}$ and $j = J/J_{sc}$ respectively, where V_{oc} is the open circuit voltage and J_{sc} is the short circuit current density. The model is an equivalent rational function form and useful for design, characterization and calculation of maximum power point voltage. The model is intuitive and lacks the analytical support. In this paper an analytical derivation of the model is presented using the physics based implicit J - V equation.

Link: <http://www.sciencedirect.com/science/article/pii/S0038092X14001182>