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Abstract
Currently in photovoltaic modules fabrication, soldering is a widely used technique to interconnect solar cell strings into a module. In this method, the quality of solder joint mostly depends on the temperature and velocity of the heat source. But high temperature can introduce stress on the joints and cells. This can cause warping and possible breakages of the cells. Based on the ANSYS software, three-dimensional (3-D) finite element model was developed. The finite element model was used to evaluate the transient temperatures and thermal stresses during soldering process. First, we investigated the mechanical properties of silicon solar cell and used FEM to calculate the critical stress or load contact. And bending test is also carried out to verify the effectiveness of propose numerical models. Then, the simulations of thermal stress were conducted in two models: thermal model and mechanical model. The thermal model was developed to simulate the temperature fields on the wafer if there is a heat point moves along the tab onto the cell. Based on the characteristic of the temperature fields, the mechanical model was consequently to analyze the distribution of stress during isothermal time.
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