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Integrated Module Based on Reversely Switched Dynistor (RSD) and Its Stress Analysis

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Based on the controllable plasma layer turn-on principle, RSD(reversely switched dynsitor) has low dissipation and high di/dt capability. It is a special kind of semiconductor devices applied in the pulsed power area. Due to the advantages of small volume, low parasitic parameters and high reliability for the integrated modules, similar to the power electronic area, the integration trend has also appeared in the pulsed power area in recent years. The integrated module based on RSD is proposed and designed in this paper and its stress is analyzed. The secondary packaging integrated module of PCB level based on RSD is proposed for the first time, and by establishing the electrical-thermal-mechanical multi-physical fields coupling finite element models, the distributions of the electromagnetic and thermal stress in the module are discussed. The electromagnetic stress increases with the increase of the amplitude of the current. The thermal stress increases with the increase of the amplitude and the frequency of the current. Taken the pull-out force of pads as a standard, the limiting current is determined by the electromagnetic stress at low frequency and by the thermal stress at high frequency. In the practical module, with the double-layer routing, and RSD as the boundary, the anode network of RSD is on the bottom layer of PCB while the cathode one is on the top. In the turn-on experiments of the module, the temperature is measured by the infrared thermal imager and the magnetic field is measured by the near field probe. Some contents of the model analysis are verified preliminarily.

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