

IAF SPACE POWER SYMPOSIUM (C3)  
Advanced Space Power Technologies (3)

Author: Dr. Zhihao Zhang

Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences., China

INTELLIGENT SURGE CURRENT SUPPRESSION WITH SMALL SOLID-STATE POWER  
CONTROLLER

**Abstract**

The spacecraft power supply system is a small-capacity power supply system with limited capacity. The starting process of high-capacity capacitive loads will generate large surge current, which will seriously endanger the stability of the power supply system. The traditional surge current suppression method is adding a soft-start circuit, but it increases the system volume and power consumption. In this paper, a surge current suppression method based on solid-state linear control is proposed to restrain the surge current caused by the start-up process of the electric equipment. The load current is measured by sampling resistor, and the current is compared with the suppression threshold of surge current. When the current exceeds the threshold, MOSFET is controlled working in linear workspace. The load current rise rate is restrained and the suppression of surge current is realized. For the solid-state power linear control method, we add the MOSFET turn-on voltage to the inverse-time protection algorithm. In addition to the inverse time protection of the load current, it also protects the power consumption of the MOSFET. The advantage of this method is that the algorithm not only protects the load current, but also guarantees that the switching device is in a safe working area and prevents the device from overheating. Through intelligent algorithms, according to the characteristics of the load current and voltage, the characteristics of the load are identified, and the linear control parameters of the solid state power are adaptively set to improve the adaptability of the algorithm. The simulation analysis shows that the optimized inverse time Protection algorithm can ensure the MOSFET work in safe working area and maximize the capacity of the equipment to restrain the surge current. The method reduces the impact of the start-up process on the power supply system. The short-circuit protection capacity of solid-state power controller has increased by about 60