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技术及应用

星载DC-DC电源转换器总剂量辐射损伤效应研究

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摘要 对低功率、双输出型DC-DC电源转换器^{60}Co γ辐照后的总剂量辐射损伤及辐照后退火效应进行研究。探讨了器件在不同负载、不同输入电压条件下输入电流I_{in}、正路/负路输出电压 V_{out}、正路输出电流I_{out}、抑制模式下的输入电流$I_{inhibit}$等参数随总剂量、退火时间的变化关系。实验结果表明：虽然同为小功率器件（DVHF2812DF与 DVTR2815DF），但抗总剂量辐射能力有所差异，这与以往结果不同；由于氧化物正电荷的累积，在追加辐照时器件参数发生很大变化；满功率负载条件下器件的电参数随总剂量变化明显；抑制模式下输入电流可作为一评估器件抗辐射能力的敏感参数。

关键词 DC-DC电源转换器 辐射损伤效应 退火效应

分类号

Total Ionizing Dose Effects of DC-DC Power Converter Used in Satellite

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Abstract The total ionizing dose effects and annealing effects of DVHF2812DF and DVTR2815DF DC-DC power converters were investigated. The typical electrical parameters, such as input current, output current, output voltage, and input current of inhibition mode, as functions of the total dose with different loads and different input voltages were discussed. The relationships between these parameters and the annealing time were observed. The experiment results show that when annealing at room temperature, the trapped holes in deeper energy levels anneal little, which results in dramatic changes of the electric parameters of the DVHF2812DF device when irradiated with extra dose irradiation. However, these parameters go back to the initial values when annealing at high temperature. There are more changes of the electric parameters under the full power loaded situation than other conditions. The input current under inhibition mode can be considered as a sensitive parameter in the evaluation of the radiation-hardened levels of the devices.

Key words DC-DC power converter irradiation damage effects annealing effects

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