

电机与电器

变压器耦合式固体继电器传导发射分析方法研究

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摘要:

在采用变压器耦合作为隔离电路的固体继电器中, 变压器工作在自激振荡状态, 通过磁芯将高频信号传递到变压器次级, 较高的du/dt和di/dt产生较大的对外传导干扰, 严重时会影响到其他电子设备的正常工作。以某型号变压器耦合式直流固体继电器为研究对象, 在建立功率二极管、功率MOSFET的高频模型和变压器等效电路模型, 以及考虑寄生参数对传导发射影响的基础上, 建立固体继电器用于传导发射分析的精确时域电路模型。采用Pspice软件仿真得到固体继电器输入端电源线对外传导发射量, 仿真结果与实验结果吻合良好。为抑制传导发射, 提出在固体继电器输入端串入EMI滤波器的优化方案。试验结果显示, 优化后输入端电源线对外传导发射低于国军标GJB1515A-CE102的规定, 提高了固体继电器的电磁兼容性能。该固体继电器传导发射分析方法对继电器的电磁兼容性能预测具有指导意义。

关键词: 变压器耦合 固体继电器 传导发射 EMI滤波器 电磁兼容

Research on Analysis Method of Conducted Electromagnetic Emission of DC Solid State Relay With Transformer Isolation

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Abstract:

In a DC solid state relay (SSR) with transformer isolation circuit, the transformer works at self-oscillating state and the high frequency signal would be transmitted to the secondary coil through the magnet core. The high du/dt and di/dt would produce high conducted electromagnetic interference (EMI), even interfere with other electronic devices. In this paper, a certain type of DC SSR was investigated. An accurate time-domain circuit model used for analyzing conducted EMI of SSR was proposed based on the high frequency model of power diode and MOSFET, the equivalent circuit of dual-winding transformer and the parasitic parameters of SSR. The conducted emitting energy at the input port power line of SSR was simulated by Pspice software and the simulation results agreed well with the experiment. In order to suppress the EMI, an EMI filter was connected to the input port in series. The experimental results show that the conducted emitting interference at the input port power line after the optimization satisfied the requirements of the criterion (GJB1515A-CE102) and the electromagnetic compatibility of SSR is improved. The analysis method of the conducted electromagnetic emitting of SSR proposed is of great value for the EMC prediction of the relay.

Keywords: transformer isolation solid state relay (SSR) conducted EMI EMI filter electromagnetic capability (EMC)

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