

电力电子与电力传动

新型单级隔离型软开关功率因数变换器

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收稿日期 2006-5-8 修回日期 网络版发布日期 2008-3-25 接受日期

摘要

提出一种兼具软开关和箝位的新型单级隔离型功率因数校正(power factor correction, PFC)变换器拓扑。该变换器能满足电气隔离的应用要求,提升单级隔离型PFC的功率等级。与传统单级结构相比,新拓扑输入电流校正效果明显,功率因数接近1。比较理想地解决了限制单级PFC功率等级的变压器漏感和直流母线电容应力问题。箝位电容被充分利用简化了零电压过渡(zero voltage transition, ZVT)技术在隔离型变换器中的应用,既改善了半导体器件的开关环境、优化系统电磁兼容,又提高了变换效率。实验制作一台87 kHz, 1 kW的样机。实验结果表明,这种变换器的效率基本能够达到93%(半载以上),功率密度提高,适合于中大功率应用场合。

关键词 [单级隔离](#) [全桥](#) [功率因数校正](#) [零电压过渡](#) [箝位](#)

分类号 [TM646](#); [TM76](#)

Novel Single-stage Isolated ZVT Power-factor-corrected Converter

Abstract

A novel power factor correction topology, which is based on isolated type full-bridge structure and features soft-switching and active-clamping, is presented. The topology satisfies the requirement of galvanic isolation and greatly increases the power level of single-stage PFC converter. Compared to conventional single-stage topology, input current is well corrected and power factor appropriates to 1. Problem resulted by leakage inductor that limits the power level of isolated PFC converter is resolved and moreover, the very topology greatly reduces the voltage stress of DC link capacitor. Clamping capacitor is fully utilized that simplifies the application of ZVT technology in isolated type converter, switching condition is greatly optimized and EMC is improved as well, moreover, the whole efficiency is greatly improved. Finally, a prototype based on the presented topology, whose switching frequency is 87 kHz and rating power is 1 kW, is built. That the conversion efficiency is more than 93% when load is more than half of rating level is verified by experimental result, power density is increased and the very topology is appropriate to application with requirement of medium-high power level.

Key words [single-stage isolated](#) [full-bridge](#) [power factor correction](#) [zero-voltage-transition](#) [active clamp](#)

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