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电力电子与电力传动

DC-DC变流器整流二极管零电流软关断方法

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摘要： 针对现有DC-DC变流器对起整流作用的二极管零电流关断软技术研究不足，从而不能进一步减小变流器开关损耗的现状，从二极管零电流关断的定义出发，通过理论分析和实例说明相结合的方式，提出实际电路中二极管零电流软关断的判断方法，并总结和归纳两种实用性整流二极管零电流关断技术和其主要特征。在此基础上，根据实际应用场合的需要，经过的一系列的拓扑推演，提出一族具有斩波管可实现零电压开启、整流管可实现零电流关断特性的新颖拓扑族，实现了开关损耗的最小化，无需外加任何开关管缓冲网络，可适用于双向DC-DC变流场合。一个适用于不间断电源(uninterruptible power supply，UPS)系统的样机验证了该拓扑族的有效性和在实际应用中的优越性。

关键词： 零电流关断 零电压开启 拓扑同构 拓扑对偶

Method of Zero Current Turn-off Technique for Rectifier Diode in DC-DC Converters

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Abstract:

To improve the present status that insufficient attention has been paid on the subject of zero current turn-off applied to the diodes which play as the rectifiers, and minimize the switching frequency of the converter, this paper presents the methodology which can determine a diode whether achieves zero voltage turn-off, via the theory analysis and example illustration, based on the definition of zero current turn-off. This paper also concludes the two practical ways to realize zero current turn-off for the rectifier diodes. Furthermore, a family of novel topologies which feature in zero voltage turn-on for the inverting switches and zero current turn-off for the rectifiers is proposed, via the deviation of topologies. Every member of this topology family is snubber-free, thus they are very suitable for the bidirectional DC-DC converters. A prototype, which can be applied in the UPS(Uninterruptible Power Supply) system, verifies the validity of the family of the snubber-free topologies and its superiority if implemented into practical applications.?

Keywords: zero current turn-off zero voltage turn-on topology isomorph topology duality

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