

stress. To handle the energy trapped in the leakage inductance of the coupled inductors, a simple passive-clamp circuit is added to the proposed converter, which can effectively recycle the energy and suppress voltage spike. With the proposed converter, conversion efficiency therefore can be improved significantly.

In this paper, analysis of the proposed converter has been presented in detail, including operational principle and characteristics. To verify the feasibility of the proposed converter, design consideration and power loss estimation are also discussed. An experimental prototype for the proposed converter is built and evaluated. Experimental results have demonstrated that the proposed ICBC can achieve high efficiency over a wide load range. Compared with the conventional IBC, it improves efficiency by 1.5%. The proposed ICBC is relatively suitable for non-isolation, high step-down voltage and low output current ripple applications.

References:

- [1] Hong Mao, *et al.*, "Analysis of Inductor Current Sharing in Non-isolated and Isolated Multiphase dc-dc Converters," *IEEE Transactions on Industrial Electronics*, Vol. 54, No. 6, Dec. 2007, pp. 3379-3388.
- [2] M. López, *et al.*, "Current Distribution Control Design for Paralleled DC/DC Converters Using Sliding Mode Control," *IEEE Transactions on Industrial Electronics*, Vol. 51, No. 2, Apr. 2004, pp. 419-428.
- [3] Xiong Du, Luwei Zhou, and Heng-Ming Tai, "Double-Frequency Buck Converter," *IEEE Transactions on industrial Electronics*, Vol. 56, No. 5, May 2009, pp. 1690-1698.
- [4] Shen-Yaur Chen and Jin-Jia Chen, "Study of the Effect and Design Criteria of the Input Filter for Buck Converters with Peak Current-Mode Control Using a Novel System Block Diagram," *IEEE Transactions on Industrial Electronics*, Vol. 55, No. 8, Aug. 2008, pp. 3159-3166.
- [5] J. J. Lee and B. H. Kwon, "DC-DC Converter Using a Multiple-Coupled Inductor for Low Output Voltages," *IEEE Transactions on Industrial Electronics*, Vol. 54, No. 1, Feb. 2007, pp. 467-478.
- [6] P. L. Wong, P. Xu, B. Yang, and F. C. Lee, "Performance Improvements of Interleaving VRMs with Coupling Inductors," *IEEE Transactions on Power Electronics*, Vol. 16, No. 4, Jul. 2001, pp. 499-507.
- [7] Peng Xu, Jia Wei, and Fred C. Lee, "Multiphase Coupled-Buck Converter—A Novel High Efficient 12 V Voltage Regulator Module," *IEEE Transactions on Power Electronics*, Vol. 18, No. 1, Jan. 2003, pp. 74-82.
- [8] Milan Ilic and Dragan Maksimovic, "Interleaved Zero-Current-Transition Buck Converter," *IEEE Transactions on Industry Applications*, Vol. 43, No. 6, Nov. 2007, pp. 1619-1627.
- [9] Chu-Yi Chiang and Chern-Lin Chen, "Zero-Voltage-Switching Control for a PWM Buck Converter under DCM/CCM Boundary," *IEEE Transactions on Power Electronics*, Vol. 24, No. 9, Sep. 2009, pp. 2120-2126.
- [10] Yaow-Ming Chen, *et al.*, "Interleaved Buck Converters with a Single-Capacitor Turn-Off Snubber," *IEEE Transactions on Aerospace and Electronic System*, Vol. 40, No. 3, July 2004, pp. 954-967.
- [11] K. Yao, *et al.*, "Tapped-Inductor Buck Converter for High-Step-Down DC-DC Conversion," *IEEE Transactions on Power Electronics*, Vol. 20, No. 4, 2005, pp. 775-780.
- [12] K. Yao, *et al.*, "Tapped Inductor Buck Converters with a Lossless Clamp Circuit," *Proceedings of the Applied Power Electronics Conference*, Vol. 2, 2002, pp. 693-698.
- [13] P. Xu, J. Wei and F. C. Lee, "The Active-Clamp Couple-Buck Converter-A Novel High Efficiency Voltage Regulator Module," *Proceedings of the Applied Power Electronics Conference*, Vol. 1, 2001, pp. 252-257.
- [14] E.-S. Kim, *et al.*, "An Improved Soft-Switching PWM FB DC/DC Converter for Reducing Conduction Losses," *IEEE Transactions on Power Electronics*, Vol. 14, No. 2, Mar. 1999, pp. 258-263.
- [15] Y. Jang, M. M. Jovanović, and Y. M. Chang, "A New ZVS-PWM Full-Bridge Converter," *IEEE Transactions on Power Electronics*, Vol. 18, No. 5, Sep. 2003, pp. 1122-1129.
- [16] R. Martinelli and C. Ashley, "Coupled Inductor Boost Converter with Input and Output Ripple Cancellation," *Proceeding of the Applied Power Electronics Conference*, 1991, pp. 567-572.