Single-Stage High-Power-Factor Electronic Ballast with a Symmetrical Class-DE Resonant Rectifier

Chainarin Ekkaravaroode and Kamon Jirasereamornkul

A novel, single-stage, high-power-factor, electronic ballast with a symmetrical class-DE low-$dV/dt$ rectifier as a PFC is proposed in this paper. The proposed PFC was achieved by using a bridge rectifier that serves as a symmetrical class-DE resonant rectifier. The two active power switches were operated under the ZVS condition. By using this topology, the conduction angle of the bridge rectifier diode current was increased, resulting in a low-line current harmonic, a power factor near unity, and reductions in the size and weight of the EMI filter. The prototype ballast was implemented to drive a T8-36W fluorescent lamp. The switching frequency was fixed to approximately 84 kHz. Experimental results verified the theoretical analysis. The designed electronic ballast had a power factor of 0.99, a 1% THDi (which satisfies the lighting equipment IEC 61000-3-2 class-C standard), a 1.42 lamp-current crest factor (which meets the lamp manufacturer recommendations), and an efficiency of 90%.