Forward Conduction Mode Controlled Piezoelectric Transformer-Based PFC LED Drive

Light-emitting diode (LED) illumination is getting more and more common; as LED’s performance is rising, the price is falling and is getting competitive. Some of the challenges of ac mains supplied illumination are the requirement of power factor correction (PFC) and the competitiveness of a low priced market. In this paper, a new forward conduction mode (FCM) control method for piezoelectric transformer (PT)-based power converters is proposed. A PT-based LED drive facilitating passive PFC is developed, utilizing and validating the FCM control method. The drive utilizes an inductorless half-bridge topology and for circuit minimization and simplicity it has no load regulation and has a 100-Hz output modulation. The proposed FCM control method ensures that the PT is operated at its optimal operation frequency, which ensures soft-switching operation and a constant gain. As a result a 6.5-W PT-based PFC LED drive has been developed, supplied from 230-V 50-Hz ac mains, achieving a power factor of 0.96.

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