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Simulation and Analysis of Bridgeless Dual Boost PFC with LLC Resonant Converter for Battery Charging Applications

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Abstract : This paper proposes an analysis and simulation of high power factor, high efficiency two-stage AC - DC power converter for charging application. The first stage comprised of active power factor correction (PFC) circuit namely, bridgeless dual boost PFC to provide a DC supply from a single phase 50Hz, 220V AC. The latter stage is half bridge LLC resonant converter for dc/dc conversion. The conventional or bridge PFC boost rectifiers are nonlinear in nature and consequently generate harmonic currents in AC line power resulting in low power factor and high percentage total harmonic distortion (THD). The harmonic distortions have numerous harmful effects, including low percentage efficiency and interfere with the communication, control circuits nearby. To improve the quality of the line current and to get power factor closer to unity bridgeless dual boost PFC is analyzed in this paper and LLC resonant converter with improved efficiency. The circuit is simulated using PSIM. Simulation results shows that the first-stage bridgeless dual boost PFC achieves reduced ITHD of 1.2 % and a power factor of above 0.99 compared to bridge PFC and the second stage LLC converter operates with 94.23% peak efficiency.

Keywords: Bridgeless dual boost PFC, Half bridge LLC Resonant Converter, Current Total Harmonic Distortion (ITHD), Power Factor (PF).

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