Flyback-Based Three-Port Topologies for Electrolytic Capacitor-Less LED Drivers

Introduction:

High-brightness light-emitting diode (LED) possesses advantages such as high luminous efficiency, Long lifespan, small size, energy saving, easy dimming, and so on. Thus, this environmental friendly lighting Technology has been widely applied in many fields and noticed by policy-makers all over the world.

The optical Performances (including the luminance, luminous flux, color temperature, lighting efficiency, etc.) And thermal properties (including junction temperature, thermal resistance, etc.) Of LED will be severely influenced by the output properties of the driver which is to say that LED driver with good quality is the guarantee of LED luminescence capability and the overall functionality of the entire lighting system.

Proposed system:

An integrated dual flyback converter (IDFC) is chosen, which requires less switching components and simpler control strategy electrolytic capacitor less TPC LED driver converter is proposed. Flyback converter is widely used in LED drivers thanks to its input–output isolation as well as its easier realization in PFC.
A block diagram of three-port converter (TPC) for LED drivers is proposed, where TPC connects the main power source, the storage capacitor $C_a$, and the LED load, fulfilling the function of PFC and output current regulation. The input power $p_{in}$ and output power $p_o$ are all unidirectional, while the power of $C_a p_c$ is bidirectional.

$S_1$ is controlled by the feedback loop of the average voltage $v_{Ca}$. A photocoupler is used to sense $v_{ca}$ and a passive $RC$ filter is used to remove the ripple from the sensed voltage. Being regulated with a PI controller, a pulse width modulation (PWM) signal $G_1$ is generated for the switching control of $S_1$. In a line-frequency period, because the average voltage of $Ca$ is almost stable, the duty cycle of $S_1$ is consequently almost constant.

**Advantages:**
- Less switching components
- And simpler control strategy

**Applications:**
- High power Led applications.

**Block Diagram:**

![Block Diagram Image]