Technical Article

Power Tips: What's the Best Way to Drive Synchronous Rectifiers in a Flyback Supply?

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There are numerous techniques for driving synchronous rectifiers (SRs) in a flyback topology: using a gate-drive transformer, having the power transformer self-drive the SR, or using a specialized driver.

The gate-drive transformer and self-driven techniques result in less-than-optimal efficiency due to either shoot-through or reverse-recovery losses – I discussed this in more detail in my latest Power Tips post on EE Times.

But specialized SR drivers have evolved over the years. Using a driver that implements volt-second balancing to drive the SR will minimize the shoot-through and reverse-recovery losses and maximize efficiency.

With volt-second balancing, the driver monitors the volt-seconds present on the secondary transformer winding during the ON time of the primary FET. When the secondary winding voltage collapses due to the primary FET turning off, the driver turns on the SR and applies the same number of volt-seconds in the reverse direction.

This drive technique is very simple and only requires a few resistors: a divider to sense the transformer winding voltage, a divider to sense the output voltage and a resistor to program the blanking time. Figure 1 shows an example simplified schematic.

Transformer-driven techniques typically force continuous conduction operation. However, volt-second balancing allows discontinuous operation and is perfect for quasi-resonant operation. As a result, more designers of AC/DC adapters are adopting this technique.

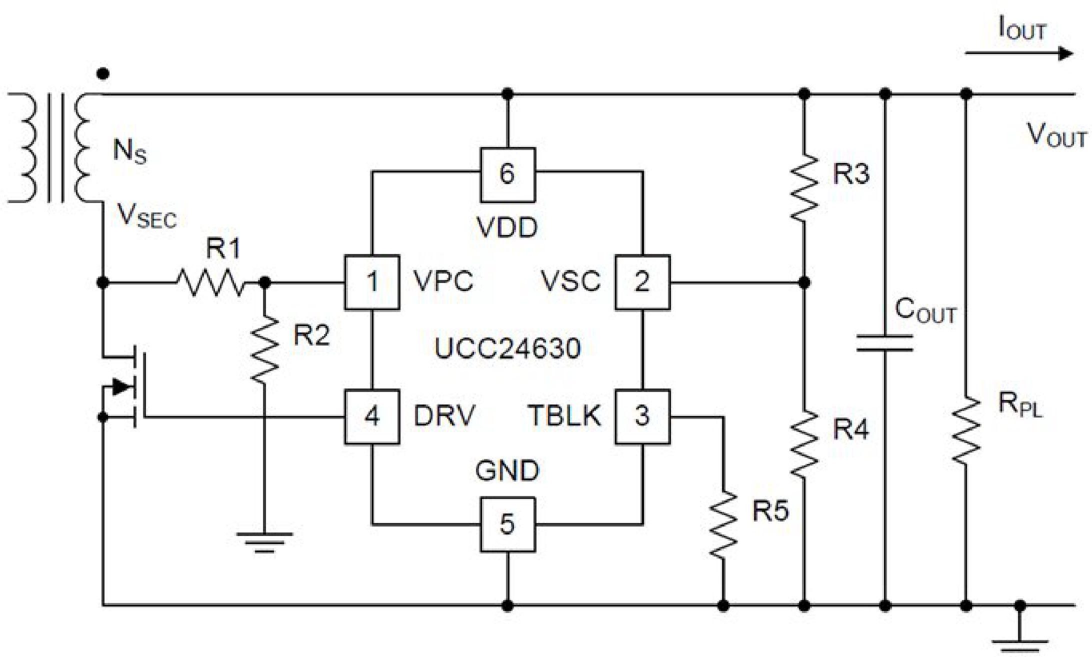

Figure 1. A Synchronous Rectifier Driver with Volt-second Balancing Provides a Simple and Very Effective Solution

If you've been using transformer-driven SR in flyback designs, next time consider a specialized SR driver.

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Additional Resources

- These power supplies use a volt-second balancing driver from our TI Designs library of power reference designs:
  - Universal AC Input 5V/10A/50W PSR Flyback Power Supply With Over 89% Avg Efficiency Reference Design
  - 65W High-Efficiency CoC-5 Tier2/DOE Level VI AC Adapter

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