MPS's Isolated Power Solutions Promote Carbon Neutrality

Introduction

The revolution for a carbon-neutral era goes beyond an environmental commitment. With premiums on energy-saving solutions that reduce emissions, markets and individual companies are shifting their industrial and energy infrastructures to produce unique and environmentally conscious products. Across various power categories (e.g. photovoltaic and wind power generation, energy storage, battery management systems, and power supplies), high-power solutions such as electrical isolators are vital for creating safe and green systems.

MPS has introduced a series of dedicated controllers for high-power applications, as well as power ICs with high-voltage capacitive isolation technology. These MPS controllers provide the industry with efficient, simple, and reliable choices that can reduce the carbon footprint.

Energy Efficient Products

The MP18831 is an isolated half-bridge gate driver with up to 4A of sink peak current capacity (see Figure 1). Using MPS's proprietary, high-voltage capacitive isolation technology, the MP18831 can achieve a withstand voltage of up to $5kV_{RMS}$, and a common-mode transient immunity (CMTI) rated above 100kV/µs. The gate driver drives several types of power switching devices with a short propagation delay and low pulse-width distortion. With package options including the wide body SOIC-16, narrow body SOIC-16, and LGA-13, the MP18831 can fit in different systems.

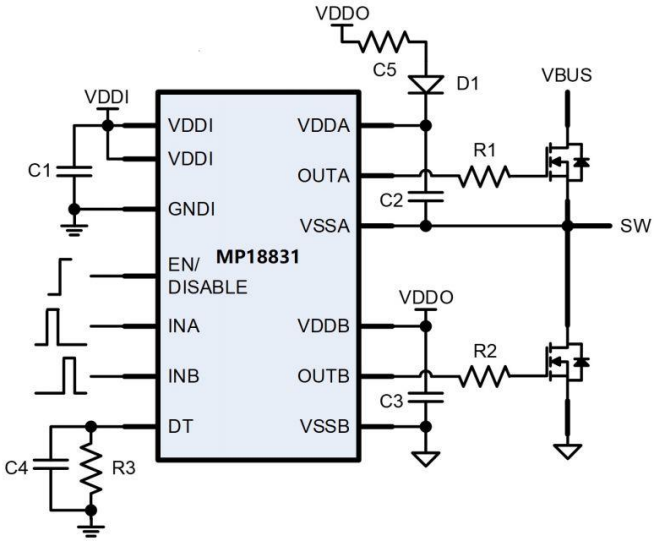

Figure 1: MP18831 Typical Application Circuit

The MPQ27800 is a four-channel digital isolator with an integrated isolated power supply (see Figure 2). The device can provide a transmission rate up to 150Mbps, and an isolated power supply of 5V/200mA. In place of a traditional optocoupler isolator, the signal transmission direction has a variety of options to improve performance. Like the MP18831, the MPQ27800 uses high-voltage capacitive isolation technology, which can achieve an isolation withstand voltage of $5kV_{RMS}$.

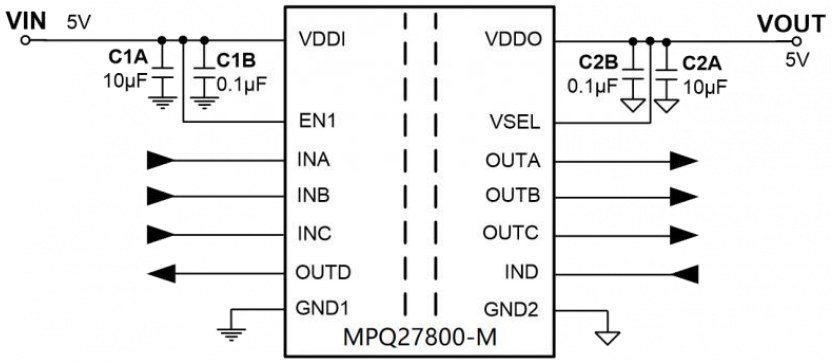

Figure 2: MPQ27800 Typical Application Circuit

For certain isolated communication applications, a separate power supply must be utilized to supply power to the interface. Consider the MID1W0505A, an isolated power supply module (see Figure 3). The MID1W0505A is a semi-regulated, 3kV$_{DC}$ isolation voltage power module that is available in an SOICW-16 package. The device supports a 4.5V to 5.5V input voltage range, 1W of output power, and excellent load regulation and linear regulation. Functional blocks such as power switch tubes, transformers, and feedback circuits are integrated in the package.

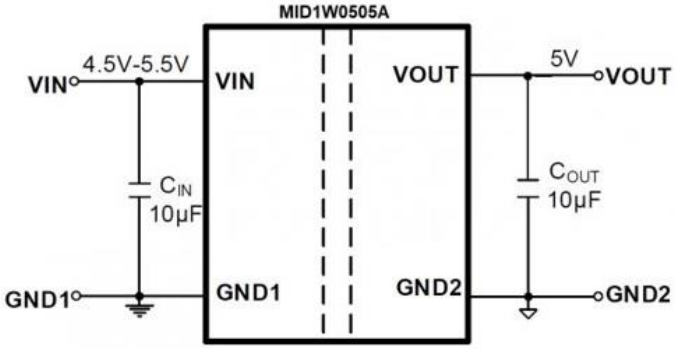

Figure 3: MID1W0505A Typical Application Circuit

The high-power power supply typically consists of a two-stage circuit: a power factor correction (PFC) solution for AC/DC power conversion and an LLC converter for DC/DC power conversion. Because controllers are the main components of the power conversion circuit, MPS introduced the MPF32010, a PFC totem pole digital controller for AC/DC power conversion (see Figure 4). The MPF32010 can be fully configured through the VB Pro™ 4.0 tool to customize the digital control loops, and set protection limits and alarm functions. In addition, these devices can also be controlled and configured through an RS-485 bus.

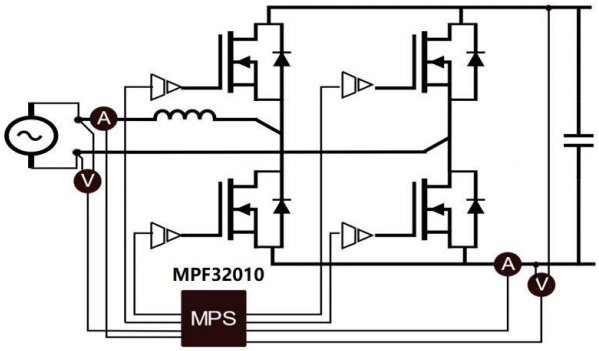

Figure 4: The MPF32010

Reference Design

The devices mentioned above were designed into a complete reference design to create a 3kW power conversion module, with a $85V_{AC}$ to $265V_{AC}$ input voltage range, and an output voltage of 48V (see Figure 5).

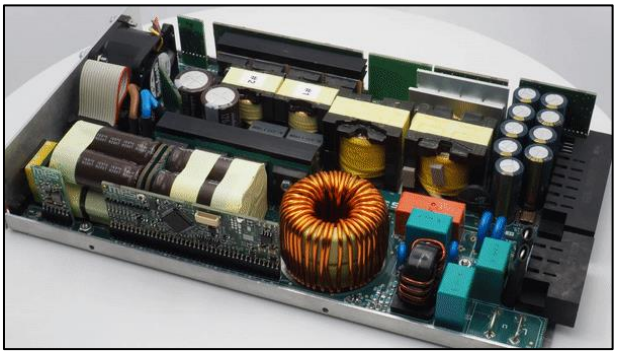

Figure 5: Totem Pole Reference Design

The reference power conversion module incorporates the latest MPS products, such as an isolated gate driver (the MP18831), a PFC + LLC combo controller (the MPF32010), and the MCS1802, an isolated current sensor (see Figure 6). This collaborative design achieves a power density of 2.14W/cm^3, with an overall conversion efficiency of up to 96%.

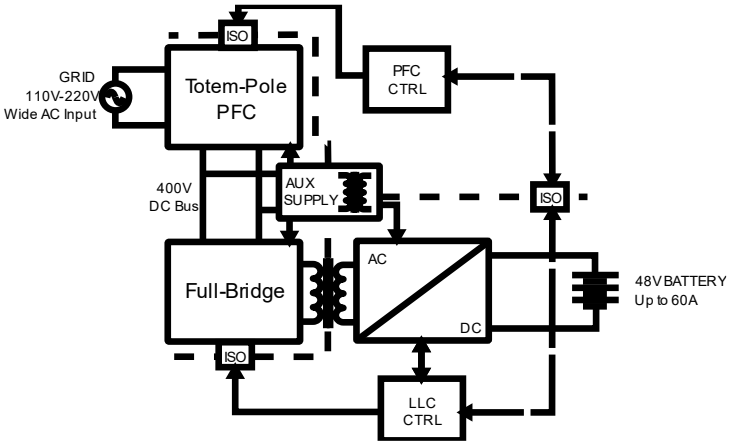

Figure 6: Reference Design Hardware Diagram

Conclusion

MPS continues to launch more environmentally conscious, isolated IC products for medium- and high-power power applications. As a result, power designers are able to evolve small-size, high-performance, and fast response power supplies with a lower cost, reduced carbon footprint, and shorter development cycles.