Application Note

CMDFSHC Ideal Applications
Low Profile Schottky Bridge Rectifiers in SMC DFN

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Introduction

Featuring a much lower forward voltage than typical PN diodes, Schottky diodes switch faster and are more energy efficient, with the tradeoff of a higher reverse current. Central's 100V CMDFSHC Schottky rectifiers series, available in both 3A and 5A versions, is ideal for high power, energy efficient applications. In addition to AC-DC conversion, these highly energy efficient Schottky rectifiers are well suited for DC-DC conversion.

Application: Boost Converter

A boost converter increases a DC signal's voltage at the expense of current, using a MOSFET as a switch, turned on and off at a regular interval. When the switch is closed, the current flows through the inductor, charging energy. After the switch opens, the inductor releases this energy through the diode and capacitor, generating a large voltage across the inductor as its voltage is proportional to the change in current. This charges the capacitor to a high voltage, which is maintained as the switch closes again and the cycle is repeated. To this end, a diode wasting as little of this high voltage as its forward voltage is desirable. Boost converters find widespread use in active power factor correction, especially in power supplies.

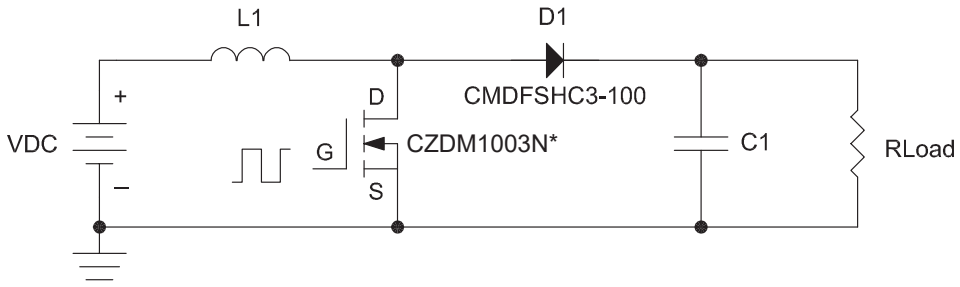

Figure 1:
Boost Converter

Application: Switched-Mode Power Supply

For many of the same reasons as a boost converter application, Central's CMDFSHC Schottky rectifiers provide high energy efficiency while also handling the high current and voltage constraints of a power supply. In this application example, the CMDFSHC3-100 serves as a secondary rectifier, converting the PWM square wave signal into DC. The primary rectifier is Central's CBRDFA4-100, a full wave bridge rectifier. The rectified signal is sent into the pulse width modulator, creating a lower voltage square wave. Going into the gate of the power MOSFET, the square wave rapidly turns the high voltage DC on and off, creating a high voltage square wave signal that is passed on to the transformer. Then, the secondary rectifier and smoothing capacitor act to make the final DC signal. An optocoupler isolates the low voltage output from the high voltage input while providing feedback, controlling the frequency of the PWM to adjust the output voltage as needed. The PWM allows for much lighter transformers as compared with linear or unregulated power supplies, enabling a lower profile with less weight, and the added benefit of increased efficiency.

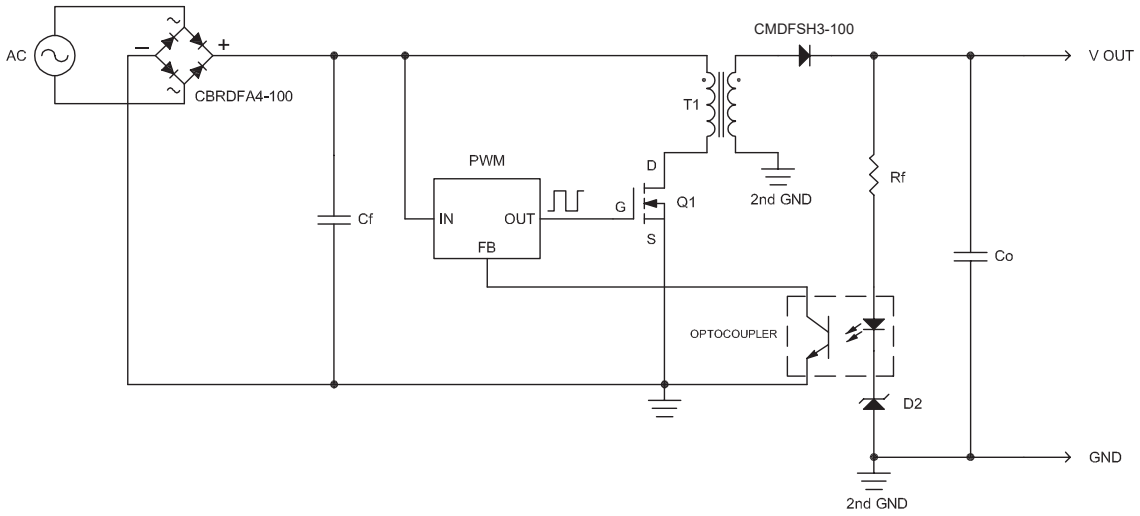

Figure 2:
Switched-Mode Power Supply

Application: Solar Cell Reverse Blocking

Schottky diodes are useful within solar panels in addition to the system following solar cells. In this manner, there are two ways these devices may be utilized: as blocking or bypass diodes. A blocking diode appears in series with the cells and acts as a check valve against reverse current. Bypass diodes are connected in parallel with the cell and can provide a detour for the current; this is beneficial when one cell in the network is faulty or in extreme shade without rays of sunlight, both of which would otherwise disable the entire network. Schottky diodes are ideal for blocking and bypass due to their fast switching times and minimal stored charge.

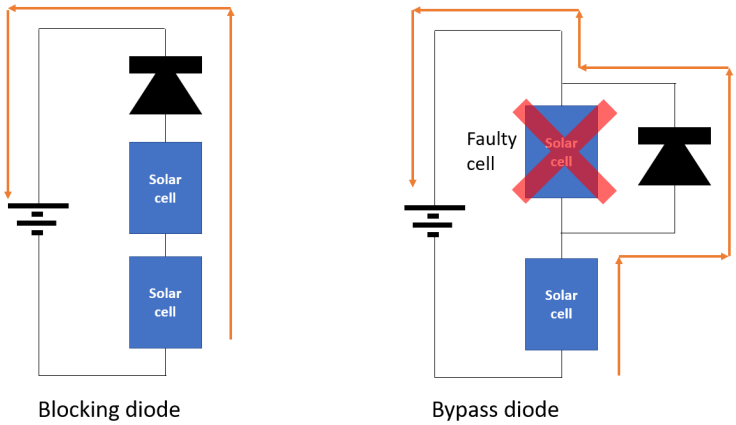

Figure 3:
Solar Cell Reverse Blocking

Application: Flyback Converter

Flyback converters can be used for both DC-DC and AC-DC conversion. When the switch is closed, energy gets stored in the primary side of the transformer and the capacitor since the diode is reverse biased. Once the switch opens, the secondary side of the transformer releases its energy, which can then pass through the diode and load.

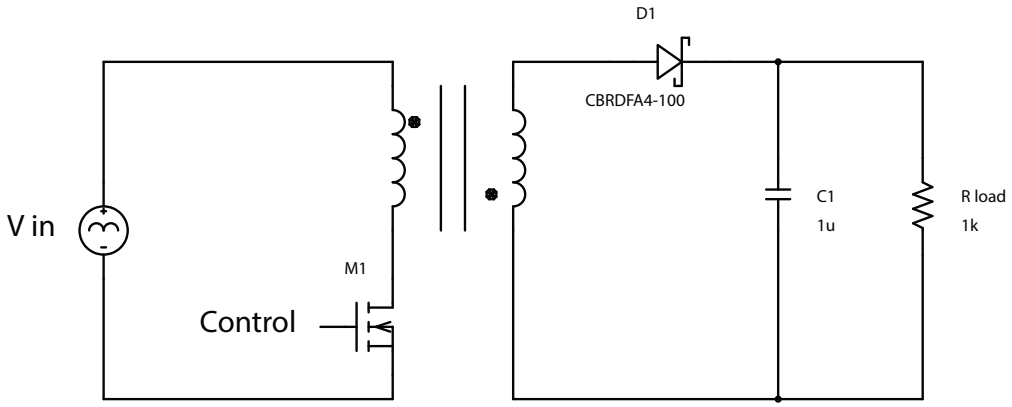

Figure 4:
Flyback Converter

Conclusion

Schottky diodes offer an alternative to the traditional PN diodes, and find ideal use when low forward voltage and fast switching speed are needed. Central's CMDFSCH Schottky diodes have these advantages and also boast high current and voltage ratings.

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