

DESIGN NOTES

Monolithic Converter Delivers High Output Voltages

Design Note 545

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Introduction

Industrial, telecom, medical and automotive applications use a wide variety of regulated voltages to operate effectively, including high voltage and negative rails. When the designer is faced with producing industrial power supplies, the job can be simplified by minimizing the parts count, as well as the number of required controller ICs. The **LT[®]8331** achieves both of these goals with an integrated 140V, 500mA switch, programmable frequency, ultra-quiescent current and light load Burst Mode[®] operation.

High voltage applications are easily accomplished using a simple boost converter, as shown in Figure 1. This application can output 120V at 25mA to 80mA in a straight boost configuration or 240V at 12mA to 35mA as a two stage boost by adding a few components, as shown inside the dotted line. The load can be taken entirely from V_{OUT2} , or a combination of V_{OUT1} and V_{OUT2} .

A high voltage negative output rail can easily be attained by configuring the converter as shown in Figure 2. This converter allows full switch voltage utilization to produce a negative output, by adding a capacitor and a diode. A coupling capacitor, C5, adds input to output disconnect during shutdown, similar to a CUK converter.

Figure 3 shows a CUK converter using the LT8331, and Figure 4 shows the efficiency curve for this inverter with a 12V input. Efficiency for this converter peaks at 84%. Burst Mode operation kicks in when the load drops to about 40mA, which allows the converter to maintain a respectable efficiency level of 73% even with a 1mA load.

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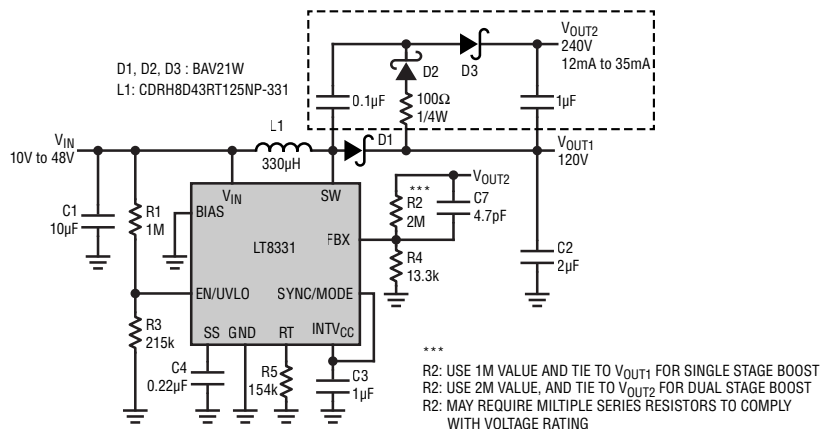


Figure 1. 120V or 240V Output Boost Converter

The LT8331 has very low quiescent current. It features an operation mode where the switching frequency is allowed to decrease progressively when a light load is detected. This mode enables the converter to maintain both high efficiency and low output ripple at light loads. The input current is just 29 μ A when the output is unloaded and about 11 μ A comes from the FBX resistor divider. If the converter is turned off by pulling the EN pin to ground, the input current drops to about 1 μ A for a 5V input, or 2 μ A with a 12V input. A good portion of the shutdown current is drawn by the EN/UVLO resistor divider.

The LT8331's 4.5V to 100V input range and its 140V rated switch make it an ideal candidate for SEPIC and CUK converters. Coupling capacitor, C5, breaks the

input to output DC path, a desirable characteristic in applications where the output must be disconnected from the input. This has the added benefit of removing the current drawn by the FBX resistor divider. The switch voltage in these converters equals the sum of the input and output voltages.

Conclusion

The LT8331 simplifies the design of high output voltage and wide input voltage applications by reducing the number of external components. Its 140V, 500mA internal switch, 100V input, programmable frequency, ultra-low quiescent current and light load Burst Mode operation make it ideal for a broad range of applications.

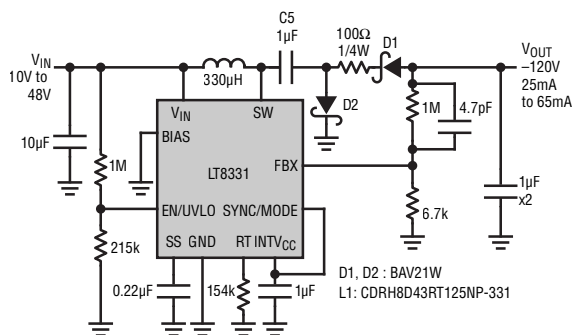


Figure 2. -120V Inverting Converter

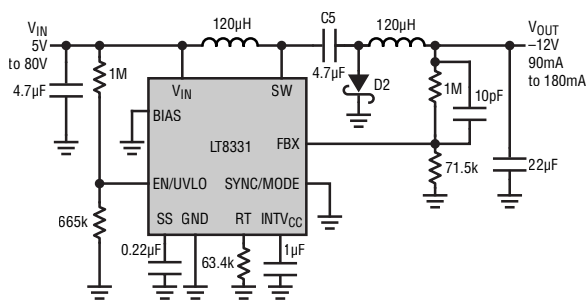


Figure 3. -12V Output CUK Converter

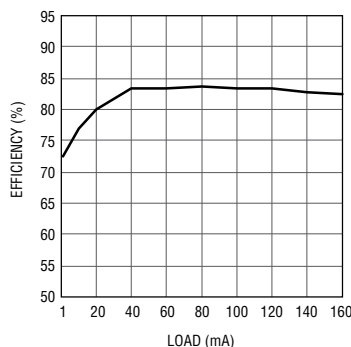


Figure 4. Efficiency Curve for Figure 3 (with a 12V Input)

Data Sheet Download

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