

DESIGN NOTES

Dual DC/DC Converter with Integrated Schottkys Generates $\pm 40V$ Outputs and Consumes Only $40\mu A$ Quiescent Current

Design Note 359

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Introduction

As portable devices become more sophisticated and require higher display resolution, there is an increased demand for accurate, high voltage bias supply solutions with wide input and output voltage ranges. The traditional methods of using arrays of capacitors to implement a charge pump or a bulky and expensive transformer no longer meet the accuracy and size requirements of today's portable devices.

The LT[®]3463 is both accurate and compact. It fits both a positive output converter plus a negative output converter into a tiny ($3\text{mm} \times 3\text{mm}$) DFN package, including Schottky diodes and switches capable of 250mA (400mA on the negative channel of the LT3463A).

The LT3463 works in a wide range of applications due to its 2.3V to 15V input voltage range and output capability to $\pm 40V$. Each converter is designed to operate with a quiescent current of only $20\mu A$, which drops to less than $1\mu A$ in shutdown, making the LT3463 solution ideal for battery-powered portable applications.

Dual Output $\pm 20V$ Converter

Figure 1 shows a $\pm 20V$ LCD bias voltage supply using the LT3463. This circuit generates both positive and negative 20V outputs from a Li-Ion battery. Low profile inductors and capacitors keep the circuit under $9\text{mm} \times 9.5\text{mm} \times 1.2\text{mm}$, making this circuit ideal for small wireless devices such as cellular phones or DSCs.

This design can produce $\pm 20V$ at 9mA from a 2.7V input and up to 20mA from a 5V input. The efficiency shown in Figure 2 exceeds 70% over a wide load current range reaching 75% at 20mA. The LT3463's constant off-time architecture allows $20\mu A$ quiescent current operation for each output, making the LCD bias circuit efficient even at $100\mu A$ load current. This circuit can accommodate different load voltages as the LCD bias voltage varies for different manufacturers (typically 9V ~ 25V).

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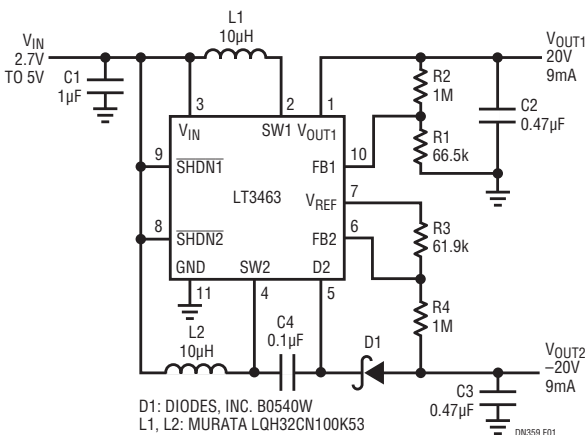


Figure 1. Dual Output $\pm 20V$ Converter

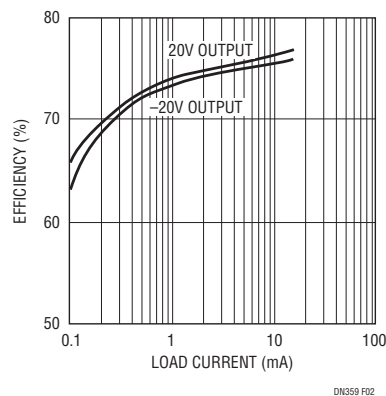


Figure 2. Efficiency of Circuit in Figure 1 at $V_{IN} = 3.6V$

Dual Output ($\pm 40V$) Converter

The circuit in Figure 3 demonstrates the impressive input and output voltage range of the LT3463. As shown, the 42V internal switches allow up to $\pm 40V$ output without a transformer or an array of diodes and capacitors. The output voltages can be easily changed by adjusting the values of R1 and R3. The circuit is designed to operate from a Li-Ion battery or two alkaline cells (down to 2.4V).

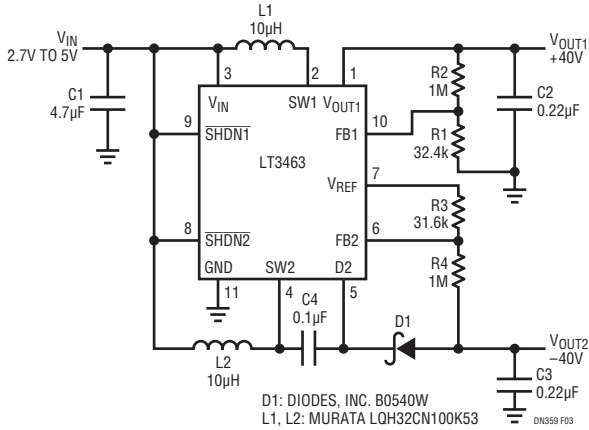


Figure 3. 2.7V to $\pm 40V$ Dual Output Converter

CCD Sensor Bias Supply

The circuit in Figure 4 shows a CCD sensor bias supply for a cellular camera phone application. The two outputs, 15V and $-8V$, are generated from a Li-Ion battery input. With a minimum input voltage of 3.3V, the circuit is designed to output 15V at 10mA and $-8V$ at 40mA to accommodate the maximum current consumption of the CCD sensor. The low power consumption of the LT3463 and its small circuit size also make this solution ideal as a general-purpose TFT display bias supply for portable devices. Figure 5 shows the efficiency and power loss data for the circuit.

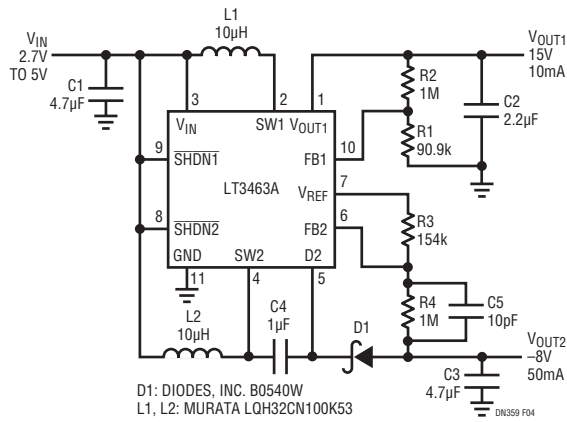


Figure 4. CCD Sensor Bias Supply

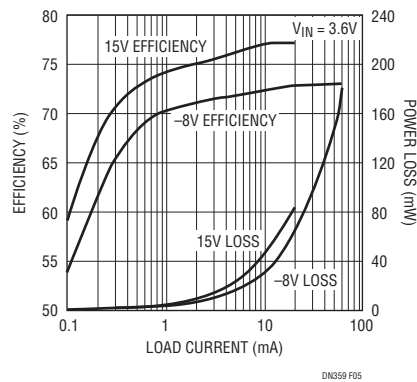


Figure 5. Efficiency and Power Loss for the Circuit in Figure 4

Conclusion

The LT3463/LT3463A are ideal solutions for high resolution portable display applications requiring multiple (positive and negative) high output voltages, wide input voltage range, low quiescent current, small circuit size and accurate output regulation.

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