LCD Power Supply Provides ±15V Plus LED Driver

by Mike Shriver

A typical LCD application requires both a positive and a negative voltage to drive the glass and, in some cases, a means of illuminating the back panel. The LT3463 circuit shown in Figure 1 provides all three. The outputs of this circuit are 15V, –15V and a 15mA LED driver. The –15V rail is generated from an inverting charge pump regulated by channel 2 of the LT3463. A quasi-regulated charge pump tapped from the switch node of channel 2 forms the 15V rail. Channel 1 is configured as current source boost converter and supplies current to the LEDs. The advantages offered by this circuit are low quiescent current and minimal parts count.

The on-demand power delivery provided by the Burst Mode operation of the LT3463 allows the ±15V rails to have a no-load quiescent current of 76µA and an efficiency of over 73% from 5% load to 100% load for an input voltage of 3.6V. The full load efficiency is 77% at 3.6V. (See Figure 2.) Because a charge pump is used for both the positive and negative output, the load is disconnected from the output during shutdown which increases battery run time. The slave charge pump for the +15V rail does require more parts than a slave boost converter, but the extra parts are offset by the internal Schottky diodes of the LT3463.

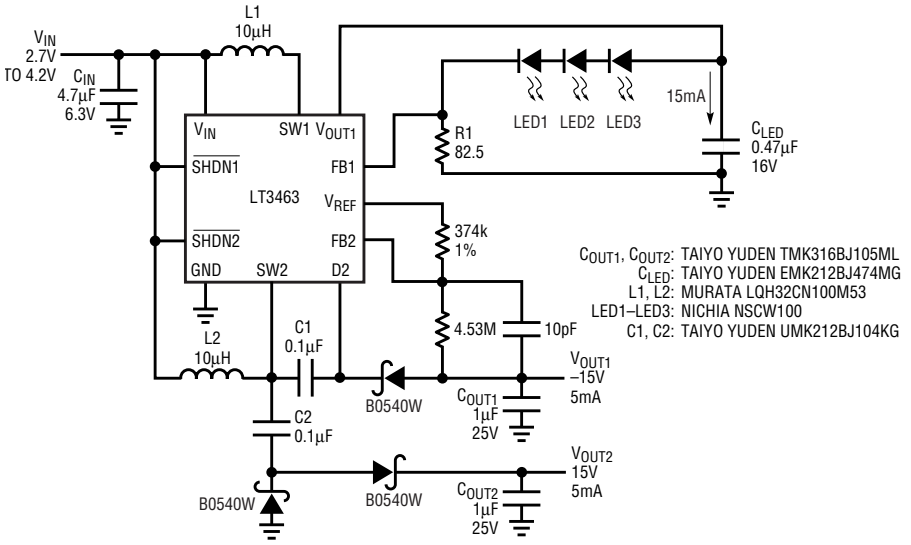

Figure 1. ±15V converter plus LED driver

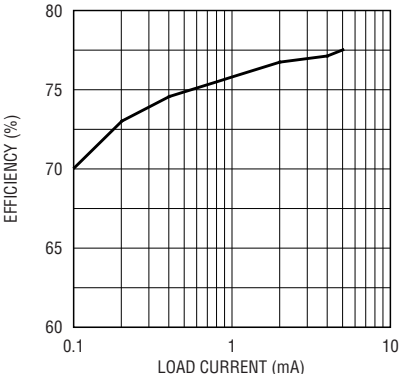

Figure 2. Total efficiency of ±15V converter at V_{IN} = 3.6V

The LED driver is best suited for applications that require only a single level of backlighting or partial dimming. The time constant formed by C_{LED} and R1 does not allow PWM dimming over the entire range of brightness. The LED driver has an efficiency of 76% at an input voltage of 3.6V. During shutdown, less than 1µA flows through the LEDs from V_{IN}.

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1.5mm Height, 2-Cell to 3.3V/1A Converter

Low-profile is required in many handheld devices, such as cellular phones, and MP3 players. Figure 3 shows how to make a 2-NiCd, or 2-NiMH cell to 3.3V output converter with 1.5mm maximum height by using a lower profile inductor and output capacitor. This circuit can provide up to 1A load current for 2V minimum input battery voltage and 900mA load if the battery cutoff voltage is 1.8V. Figure 4 shows the efficiency of this circuit. With Burst Mode enabled, the efficiency stays above 85% over three decades of load current.

Conclusion

With output disconnect, inrush current limiting and 12µA quiescent current, the LTC3421 synchronous boost converter is an ideal fit for many portable applications. Its guaranteed 1V start-up input voltage works with a large variety of battery configurations. It is available in a small 4mm × 4mm QFN package with exposed copper on the backside, making it possible to provide up to 1.2A at 3.3V from 2-cell input without taking much space.

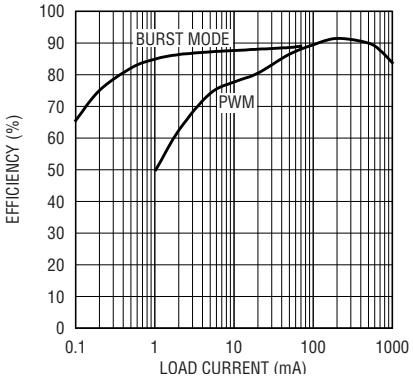

Figure 4. Efficiency curves for the converter in Figure 3 (V_{IN} = 2.4V)