LINEAR TECHNOLOGY

DESIGN NOTES

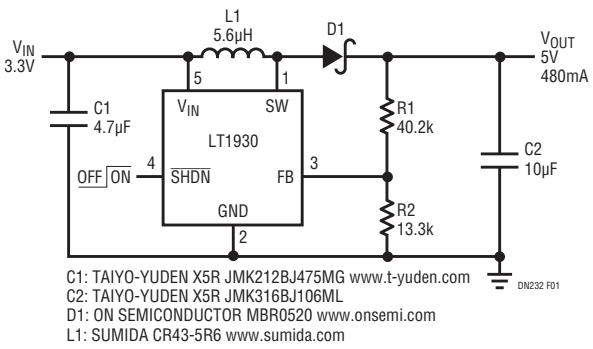
SOT-23 Switching Regulator with Integrated 1A Switch Delivers High Current Outputs in a Small Footprint – Design Note 232

Albert Wu

Linear Technology's LT®1930 is the industry's highest power SOT-23 switching regulator. The device contains an internal 1A, 36V switch and is pin compatible with both the low power LT1613 and the micropower LT1615. The LT1930 provides a simple upgrade path for users of these parts who need more power for new designs. In addition to portable applications requiring higher output currents, the device also fits well in nonbattery-operated equipment. Multiple output power supplies can now use a separate regulator for each output voltage, replacing cumbersome quasi-regulated approaches using a single regulator and custom transformers. The LT1930 utilizes a constant frequency, internally compensated, current mode PWM architecture that results in low, predictable output noise that is easy to filter. Its 1.2MHz switching frequency allows the use of tiny, low cost capacitors and low profile inductors. With an input voltage range of 2.6V to 16V, the LT1930 is a good fit for a variety of applications.

5V Local Supply

Figure 1 shows a typical 3.3V to 5V boost converter using the LT1930. The circuit can provide an impressive output current of 480mA while occupying less than 0.3" by 0.35" of board area (less than 0.105 in^2). The efficiency, shown in Figure 2, remains above 83% over a wide load current range of 60mA to 450mA, reaching 86% at 200mA. The maximum output voltage ripple of this circuit is 40mV_{P-P}, which corresponds to less than 1% of the nominal 5V output. Figure 3 is an oscillograph of the transient response. The lower waveform depicts a load step from 200mA to 300mA, the middle waveform shows the inductor current and the upper waveform shows the output voltage. The output voltage remains within 1% of the nominal value during the transient steps and displays a nice damped response with little ringing.



C1: TAIYO-YUDEN X5R JMK212BJ475MG www.t-yuden.com
C2: TAIYO-YUDEN X5R JMK316BJ106ML
D1: ON SEMICONDUCTOR MBR0520 www.onsemi.com
L1: SUMIDA CR43-5R6 www.sumida.com

Figure 1. 3.3V to 5V Boost Converter

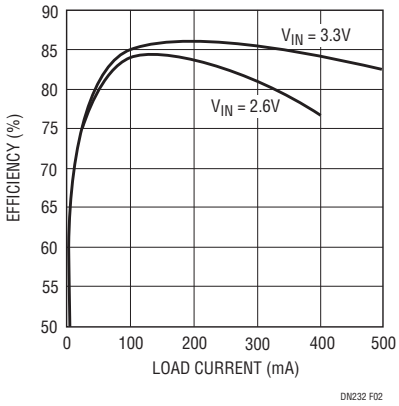


Figure 2. 3.3V to 5V Boost Converter Efficiency

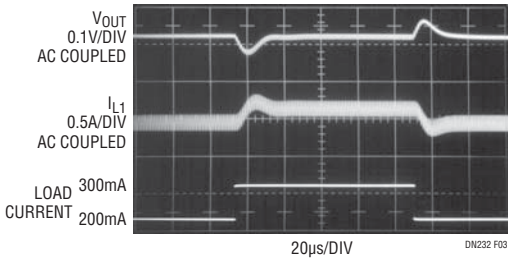


Figure 3. 3.3V to 5V Boost Converter Transient Response

12V Local Supply

Another typical application is a 5V to 12V boost converter as shown in Figure 4. This circuit can provide 300mA of output current and achieves efficiencies of up to 87% as shown in Figure 5. The maximum output voltage ripple of this circuit is 60mV$_{P-P}$, which corresponds to 0.05% of the nominal 12V output. As seen in Figure 6, the output voltage remains within 1% of the nominal value during a 50mA load step.

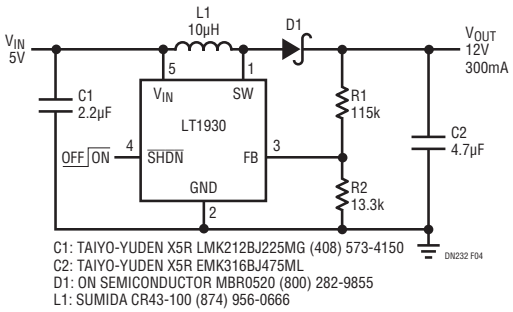


Figure 4. 5V to 12V Boost Converter

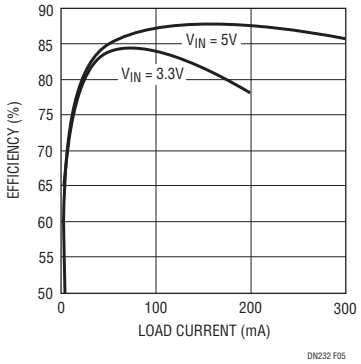


Figure 5. 5V to 12V Boost Converter Efficiency

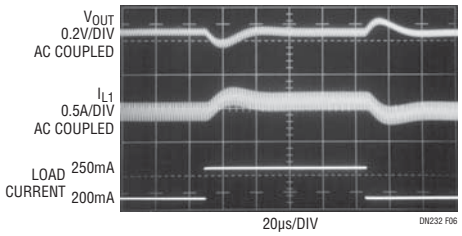


Figure 6. 5V to 12V Boost Converter Transient Response

±15V Dual Output Converter with Output Disconnect

A ±15V dual output converter using the LT1930 is shown in Figure 7. Both outputs are developed using charge pumps, so both are disconnected from the input when the LT1930 is turned off. Since the supplies are generated in the same manner, this circuit features excellent cross regulation. For a 5× difference in output currents, the positive and negative output voltages differ less than 1%; for a 10× difference, they differ less than 2%. Both outputs of this circuit can each supply up to 70mA of current. The efficiency plot for this circuit is shown in Figure 8.

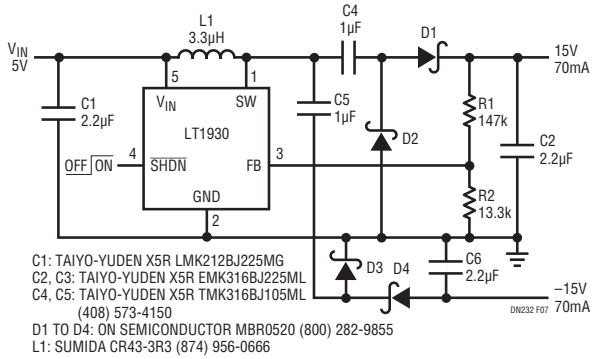


Figure 7. ±15V Dual Output Converter with Output Disconnect

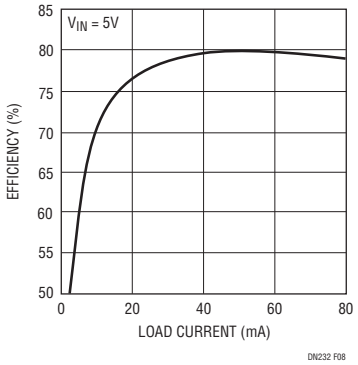


Figure 8. ±15V Dual Output Converter Efficiency

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