

DESIGN NOTES

Dual Output High Efficiency Converter Produces 3.3V and 8.5V Outputs from a 9V to 60V Rail – Design Note 479

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Introduction

Among the many step-down DC/DC switching regulator controllers, the LTC3890 stands out because of its unique features. This 50µA quiescent current device can produce two output voltages ranging from 0.8V to 24V when powered from an input voltage of 4V to 60V.

Many high input voltage step-down DC/DC converter designs use a transformer-based topology or external high side drivers to operate from up to 60V_{IN}. Others use an intermediate bus converter requiring an additional power stage. However, the LTC3890 simplifies design, with its smaller solution size, reduced cost and shorter development time compared to other design alternatives.

Feature Rich

The LTC3890 is a high performance synchronous buck DC/DC controller with integrated N-channel MOSFET drivers. It uses a current mode architecture and operates from a phase-lockable fixed frequency from 50kHz to 900kHz. The device features up to 99% duty cycle capability for low voltage dropout applications, adjustable soft-start or voltage tracking and selectable continuous, pulse-skipping or Burst Mode[®] operation with a no-load quiescent current of only 50µA. These features, combined with a minimum on-time of just 95ns, make this controller an

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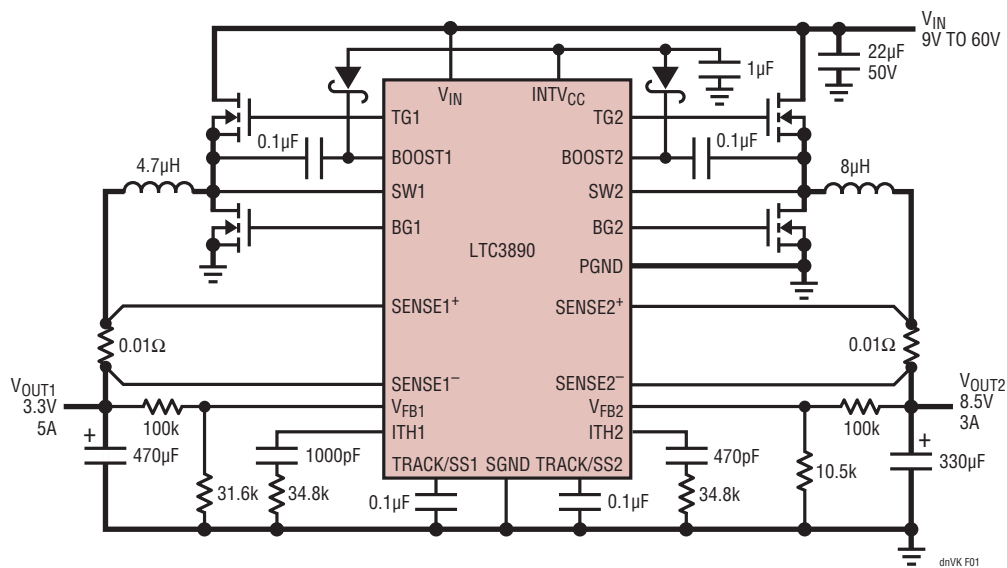


Figure 1. High Efficiency Dual 8.5V/3.3V Output Step-Down Converter

ideal choice for high step-down ratio applications. Power loss and supply noise are minimized by operating the two output stages out-of-phase.

Dual Output Application

Figure 1 shows the LTC3890 operating in an application that converts a 9V to 60V input into 3.5V/5A and 8.5V/3A outputs. The transient response for the 3.3V output with a 4A load step is less than 50mV (as shown in Figure 2).

Figure 3 shows the efficiency of the 8.5V channel with a 36V input voltage.

Single Output Application

The LTC3890 can also be configured as a 2-phase single output converter by simply connecting the two channels

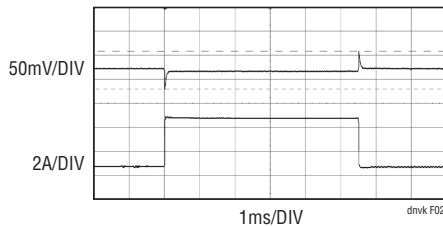


Figure 2. Transient Response of 3.3V Channel (I_{OUT1} : 1A to 5A)

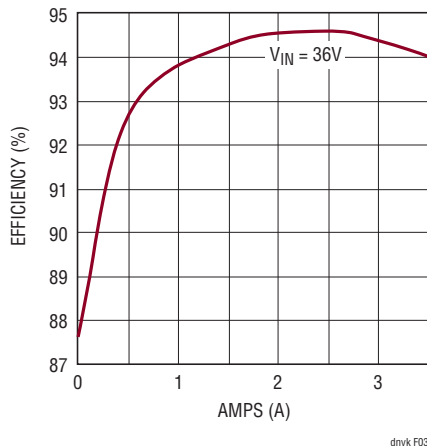


Figure 3. Efficiency of the Converter in Figure 1 for the V_{OUT2A} 8.5V Channel

together. For example, a 9V to 60V input can be converted to an 8.5V output at 6A. Figure 4 shows the efficiency of this configuration at input voltages of 10V, 30V and 60V.

Current mode control provides good current balance between the phases. Less than 10% mismatch can be achieved, as shown in Figure 5.

Conclusion

Although there are many choices in dual-output controllers, the LTC3890 brings a new level of performance with its high voltage operation, high efficiency conversion and ease of design.

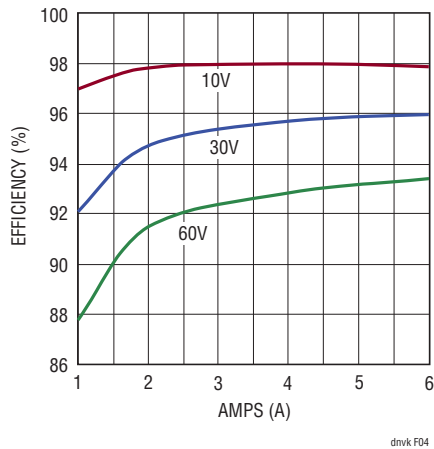


Figure 4. Efficiency of the LTC3890 Configured as a 2-Phase Single Output of 8.5V at Up to 6A from a 10V to 60V Input

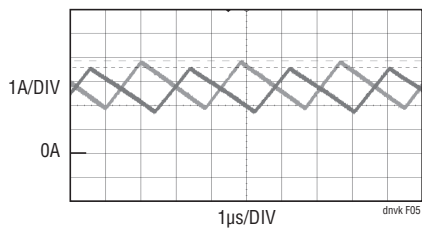


Figure 5. The Inductor Current in a 2-Phase Single Output Converter. Currents in Both Inductors Shown with a 24V Input and 8.5V at 6A Output.

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