

# DESIGN NOTES

## A Compact Dual Step-Down Converter with $V_{OUT}$ Tracking and Sequencing – Design Note 403

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### Introduction

Typical industrial and automotive applications require multiple high current, low voltage power supply solutions to drive everything from disc drives to microprocessors. For many of these applications, particularly those that have size constraints, the LT3501® dual step-down converter is an attractive solution because it's compact and inexpensive compared to a 2-chip solution. The dual converter accommodates a 3V to 25V input voltage range and is capable of supplying up to 3A per channel. The circuit in Figure 1 produces 3.3V and 1.8V.

### LT3501 Dual Converter Features

- The LT3501 is feature-rich and comes with internal 3.5A switches and sense resistors to minimize solution size and cost.
- The LT3501 operates at a fixed frequency between 250kHz and 1.5MHz, programmed using a single resistor or synchronized to an external clock, allowing optimization of efficiency and solution size.
- A 180° phase relationship between the channels is maintained to reduce input voltage ripple and input capacitor size.
- Independent input voltage, feedback, soft-start and power good functions for each converter simplify the implementation of all the tracking and sequencing options available.
- Minimum input-to-output voltage ratios are extended by allowing the switch to stay on through multiple clock cycles resulting in a 95% maximum duty cycle regardless of switching frequency.
- The LT3501 automatically resets the soft-start function if the output drops out of regulation so that a short circuit or brownout event is graceful and controlled.
- One or both converters can be shutdown at any time if they're not being used, reducing input power drain.
- The LT3501 is available in a 20-pin TSSOP package with an exposed pad for low thermal resistance.

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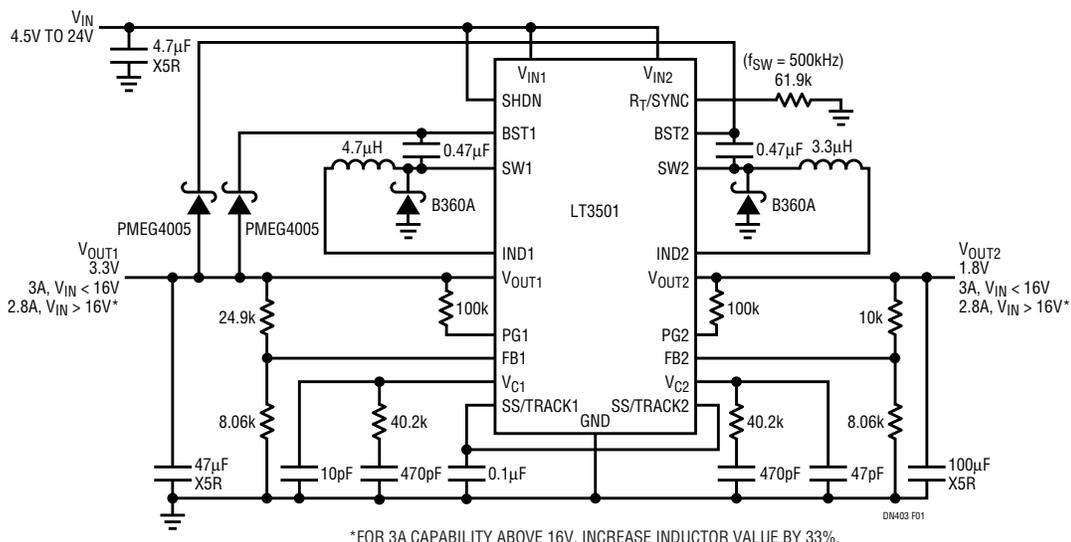


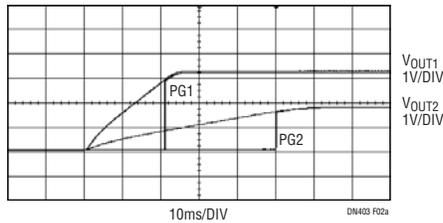
Figure 1. Compact Dual 3A Step-Down Converter with Ceramic Capacitors

## Output Supply Tracking and Sequencing

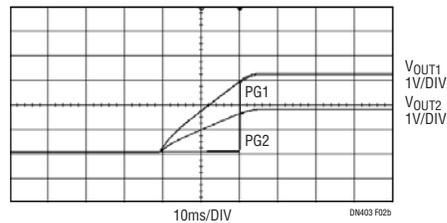
Output voltage tracking and sequencing between channels can be implemented using the LT3501's soft-start and power good pins as shown in Figures 2(a) to 2(c). Output sequencing can also be implemented as shown in Figure 2(d).

## High Current Single $V_{OUT}$ , Low Ripple 6A Output

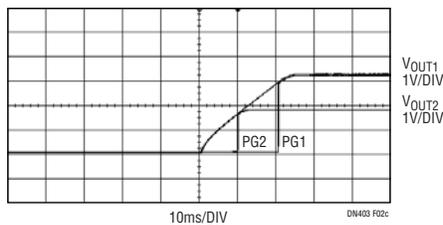
The LT3501 can generate a single, low ripple 6A output as shown in Figure 3 with the dual converters sharing a single output capacitor. With this solution, ripple currents at the input and output are reduced, thus reducing voltage ripple and allowing the use of smaller, less expensive capacitors.



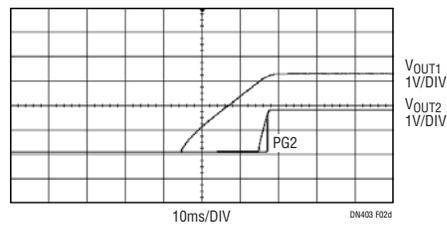
(2a) Independent



(2b) Ratiometric



(2c) Absolute



(2d) Output Sequencing

Figure 2. Output Voltage Tracking and Sequencing

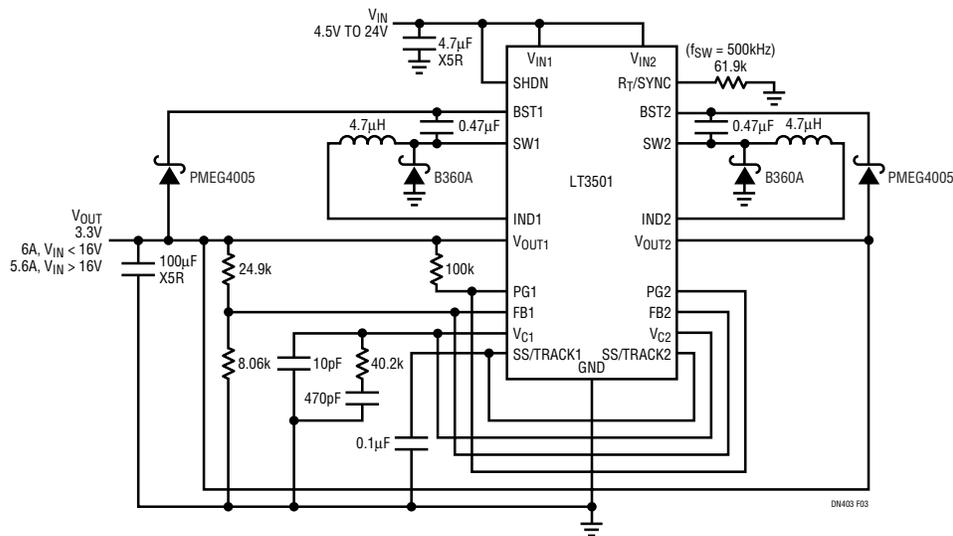


Figure 3. 4.5V to 24VIN, 3.3VOUT/6A Step-Down Converter

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