2-Phase, Dual Output Synchronous Step-Down Switching Regulator Minimizes Input Capacitors

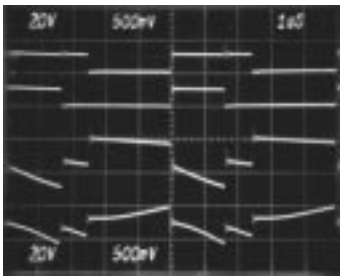
The LTC1628 dual high efficiency DC/DC controller brings the considerable benefits of 2-phase operation to portable applications for the first time. Notebook computers, PDAs, handheld terminals and automotive electronics will all benefit from the lower input filtering requirement, reduced electromagnetic interference (EMI) and increased efficiency associated with 2-phase operation.

With 2-phase operation, the two channels of the dual switching regulator are operated 180 degrees out of phase. This effectively interleaves the current pulses coming from the switches, greatly reducing the overlap time where they add together. The result is a significant reduction in total RMS input capacitor current, which, in turn, allows less expensive input capacitors to be used, reduces filtering requirements for EMI and improves real world operating efficiency.

An actual measurement of the RMS input current under these conditions shows that input capacitor ripple for a single-phase system would be 63% higher than the 2-phase system.

The reduced input ripple current also means less power lost in the input power path, which could include batteries, switches, trace/connector resistances and protection circuitry. Improvements in both conducted and radiated EMI also directly accrue as a result of the reduced RMS input current and voltage.

Typical Single-Phase



$I_{IN(MEAS)}=2.53A_{RMS}$ DC236 F03a

(a)

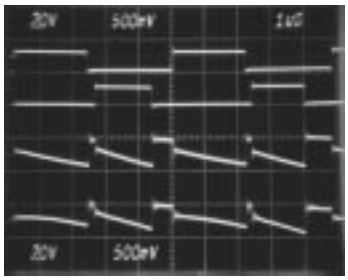
5V SWITCH: 20V/DIV

3.3V SWITCH: 20V/DIV

INPUT CURRENT: 5A/DIV

INPUT VOTAGE: 500mV/DIV

LTC1628 2-Phase

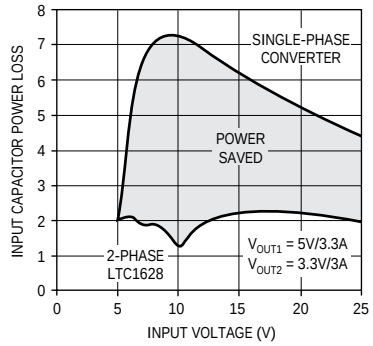


$I_{IN(MEAS)}=2.55A_{RMS}$ DC236 F03b

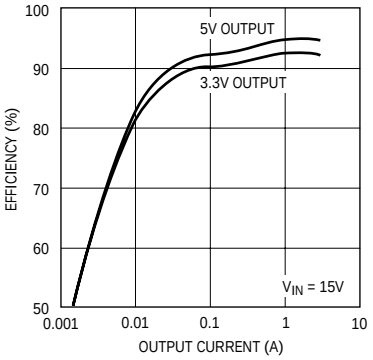
(b)

Input Waveforms Comparing Single-Phase and 2-Phase Operation for Dual Switching Regulators Converting 12V t0 5V and 3.3V at 3A Each. The Reduced Input Ripple with the LT1628 2-Phase Regulator Allows Less Expensive Input Capacitors, Reduces Shielding Requirements for EMI and Improves Efficiency

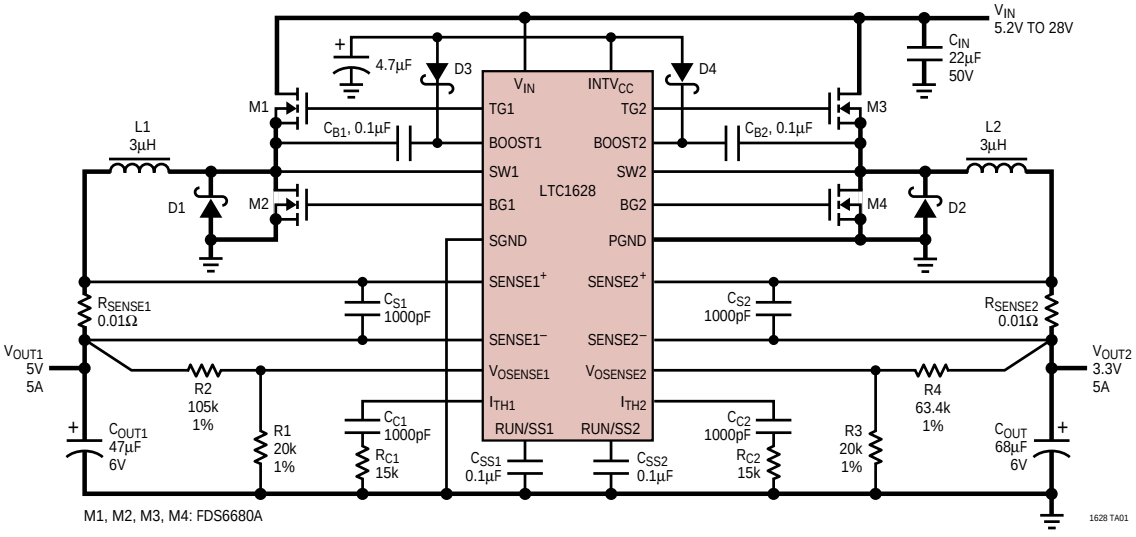
C_{IN} Power Loss vs V_{IN}



Efficiency vs Load



High Efficiency Dual 5V/3V Step-Down Converter



Source: LTC1628 Data Sheet
www.linear-tech.com/notebook.html