**Introduction**

The LTC3838 is a dual output, dual phase buck controller that employs a controlled constant on-time, valley current mode architecture to provide fast load step response, high switching frequency, and low duty cycle capability. The switching frequency range is 200kHz to 2MHz—its phase-locked loop keeps the frequency constant during steady-state operation and can be synchronized to an external clock. The LTC3838 accepts a wide input range, 4.5V to 38V, and can produce 0.6V to 5.5V outputs.

The remotely sensed VOUT1 has a voltage regulation accuracy of 0.67%, from 0°C to 85°C, even with a voltage difference of ±0.5V between local ground and remote ground. The current sense comparators are designed to sense the inductor current with either a sense resistor for high accuracy or with the inductor DCR directly for reduced power losses and circuit size.
1.5V/25A and 1.2V/25A Buck Converter

Figure 1. Dual Output, 1.5V/25A and 1.2V/25A Buck Converter Operating at $F_{SW} = 300$ kHz
Figure 1 shows a dual 25A output buck converter synchronized to an external 300kHz clock. The controlled constant on-time valley current mode architecture allows the switch node pulses to temporarily compress when a 5A to 25A load step is applied to the 1.2V rail, resulting in a voltage undershoot of only 58mV (see Figure 2). The full load efficiency for the 1.5V and 1.2V rails is 91.8% and 90.8%, respectively, as shown in Figure 3. The high efficiency is realized by the strong gate drivers, optimized dead time and DCR sensing.

The two channels operate 180° out-of-phase, which permits the use of fewer input capacitors due to input capacitor ripple current cancellation. For higher current applications, two or more phases can be tied together to form a single output, PolyPhase converter. The benefits include a faster load step response, reduced input and output capacitance, and reduced thermal dissipation.

**Detect Transient Feature Further Speeds Up Transient Response**

An innovative feature of the LTC3838 is the load release transient detect feature. The DTR pin indirectly monitors the output voltage by looking at the AC-coupled ITH signal. If the inferred overshoot exceeds a user set value, the bottom FET turns off. This allows the inductor current to slew down at a faster rate, which in turn reduces the overshoot. Per Figure 4, a 32% reduction in the overshoot is realized on the 1.2V rail. Greater improvements occur at lower output voltages.
Conclusion

The LTC3838 is a dual output buck controller ideal for applications that require a fast load step response, high switching frequency, high efficiency, and accurate output voltages. Other features include selectable operating modes: forced continuous mode (FCM) for fixed frequency operation or discontinuous mode (DCM) for higher efficiency at light load, programmable current limit thresholds, soft-start, rail tracking and individual PGOOD and RUN pins. The LTC3838 comes in a 5mm × 7mm QFN package or a thermally enhanced 38-lead TSSOP package.

LTC3838 dual buck controller with differential output sense

For applications help, call (408) 432-1900, Ext. 3720

LTC Design Notes on EDN