LINEAR TECHNOLOGY

DESIGN NOTES

70mΩ Protected Load Management Switch – Design Note 117

Mitchell Lee and Tim Skovmand

In an effort to conserve energy, simple shutdown schemes are incorporated into many battery-operated circuits. Not all circuits lend themselves to direct control, however, and instead the supply must be turned off by a switch. The LTC®1477 high side switch is designed for this purpose and includes short-circuit current limit and thermal shutdown to guard against faulty loads. Figure 1 shows a simplified block diagram of the LTC1477.

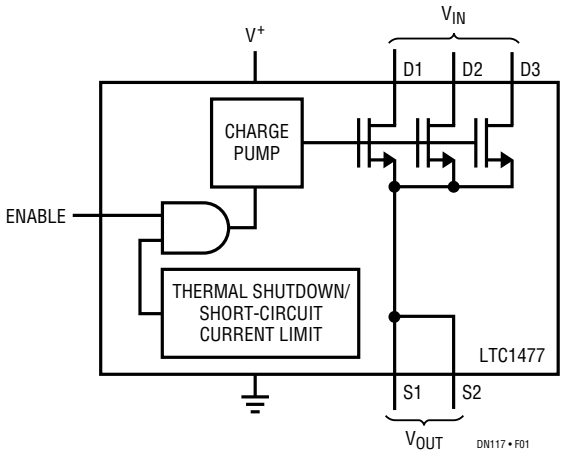

Figure 1. LTC1477 Block Diagram

At the heart of the LTC1477 is a 70mΩ N-channel MOSFET. The split drains allow for selection of 0.85A, 1.5A or 2A current limit. While enabled, the LTC1477 draws about 100μA quiescent current, dropping to 10nA in its disabled state.

Figure 2 shows the LTC1477 and LTC699 conjoined in an undervoltage disconnect application. The LTC699 microprocessor supervisor disables the LTC1477 and hence the load whenever the input voltage falls below 4.65V. An external logic signal applied to the gate of Q1 can also disable the LTC1477. When enabled, the LTC1477 output ramps over a period of approximately 1ms, thereby limiting the peak current in the load capacitor to 500mA. This prevents glitches on the 5V source line that might otherwise affect adjacent loads.

An LT®1301 is used in Figure 3 to boost a 3.3V or 5V input to 12V, such as VPP for Flash memory. Although the LT1301 features a shutdown control, the input supply can still feed through to the output through L1 and D1. Similarly, a short circuit on the output could drag down the input supply. With the addition of the LTC1477 the circuit furnishes 100% load shutdown and output short-circuit protection.

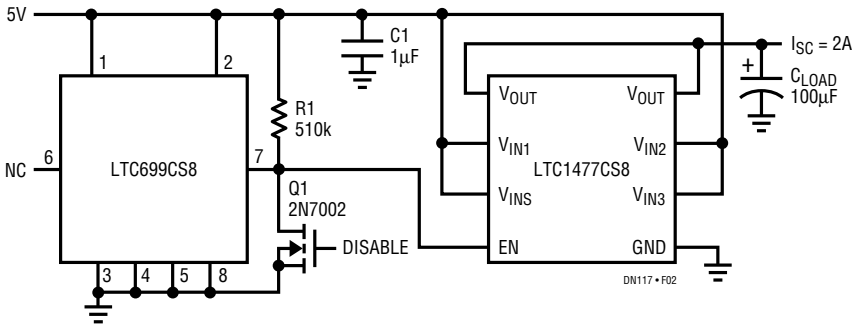

Figure 2. Switched 5V Line with Undervoltage Lockout and Current Limiting

Low voltage cutoff is desirable in battery-operated systems to prevent deep discharge damage to the battery. The LT1304 micropower boost regulator (Figure 4) contains a low-battery detector which is active even when the regulator is shut down. The output of the detector controls both the LTC1477 and the LT1304 5V boost regulator. In this application the LTC1477 serves to protect against short circuits (850mA limit selected) and completely disconnects the load under a low-battery condition. In shutdown, the circuit draws less than 25μA from the battery.

A dual version, the LTC1478 is available in a 16-pin narrow body SO package. This device is well suited for dual voltage (5V/3.3V) switching applications.

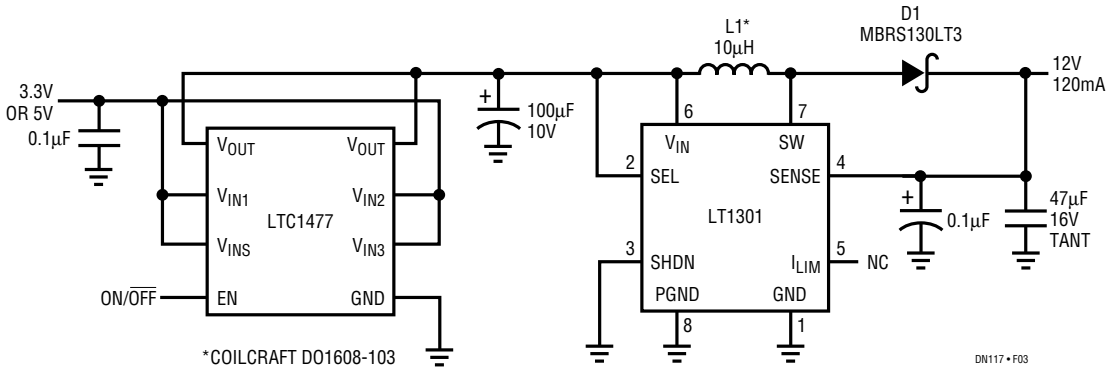

Figure 3. Short-Circuit Protection and 100% Shutdown for a Micropower Boost Regulator

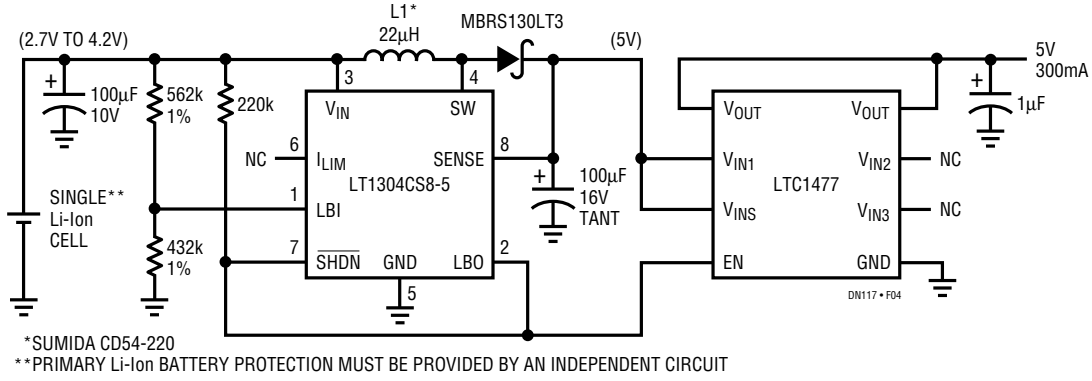

Figure 4. Situated Downstream, the LTC1477 Is Controlled by the LT1304's Low-Battery Detector

For literature on our High Side Switches, call **1-800-4-LINEAR**. For applications help, call (408) 432-1900, Ext. 525

Linear Technology Corporation
1630 McCarthy Blvd., Milpitas, CA 95035-7417
(408) 432-1900 • FAX: (408) 434-0507 • TELEX: 499-3977

LT/GP 1095 160K • PRINTED IN THE USA