

Low Voltage PowerPath Driver Switches from a 3.3V or 5V Supply to Battery Backup

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The LTC1473L solves the problem of seamless power switching between 3.3V or 5V supplies and backup battery packs (3- or 4-cell NiMH) at high current levels. By driving two sets of back-to-back N-channel MOSFET switches, the LTC1473L routes power to the input of a low voltage (3.3V to 10V) system efficiently and inexpensively. An internal micropower boost regulator is included to fully enhance the external NMOS switches, even at low operating voltages. An external 1mH inductor and 1 μ F capacitor charge V_{GG} to approximately 8.5V above V^+ , providing ample drive for the external MOSFETs. The LTC1473L includes inrush-current limiting during supply switchover to produce smooth transitions between the DC supply and the battery backup and to ensure that the load capacitors are always charged and discharged in a controlled fashion.

During start-up or under abnormal operating conditions, when voltages are varying, current can still pass to

the output load from the higher input source if the Diode pin is enabled. Enabling the Diode pin essentially converts the two external MOSFETs into diodes. This “2-diode mode” is defeated when V^+ drops below 2.5V.

Continuous short-circuit protection is also provided by a programmable timer that limits the amount of time the switches are allowed to be in current limit. When the time limit is reached, the LTC1473L removes the gate drive and then retries the offending switch, with a very small duty cycle, until the short circuit is removed, thus limiting all power dissipation to safe levels. The LTC1473L is housed in a space-efficient 16-pin narrow SSOP package and drives a wide range of N-channel MOSFET switches.

Figure 1 is a schematic diagram of an automatic PowerPath™ switch for 3.3V applications. The LTC1442 micropower, low voltage, dual comparator monitors the DC supply rail with its internal 1.182V reference and

an external resistor divider. As soon as the supply falls below 3V, the two comparator outputs change state and invert the two logic inputs (IN1 and IN2) of the LTC1473L. This action smoothly switches the load from the DC supply to the backup battery pack. For hysteresis on the comparator's trip point, an additional resistor divider can be added between the REF (6), HYST (5), and V^- (2) pins of the LTC1442 (refer to the LTC1442 data sheet for details).

Figure 2 is a schematic showing the LTC1473L switch controller in conjunction with an LT1512 battery charger. In this application, the 4-cell NiMH battery is fully charged by the 3.3VDC supply through the LT1512 buck-boost converter to ensure that it is always “topped off” and ready to provide backup power. R3 is set at 1 Ω to charge the NiMH battery pack at a constant 100mA rate.

In both applications, the value of C_{TIMER} determines the amount of time

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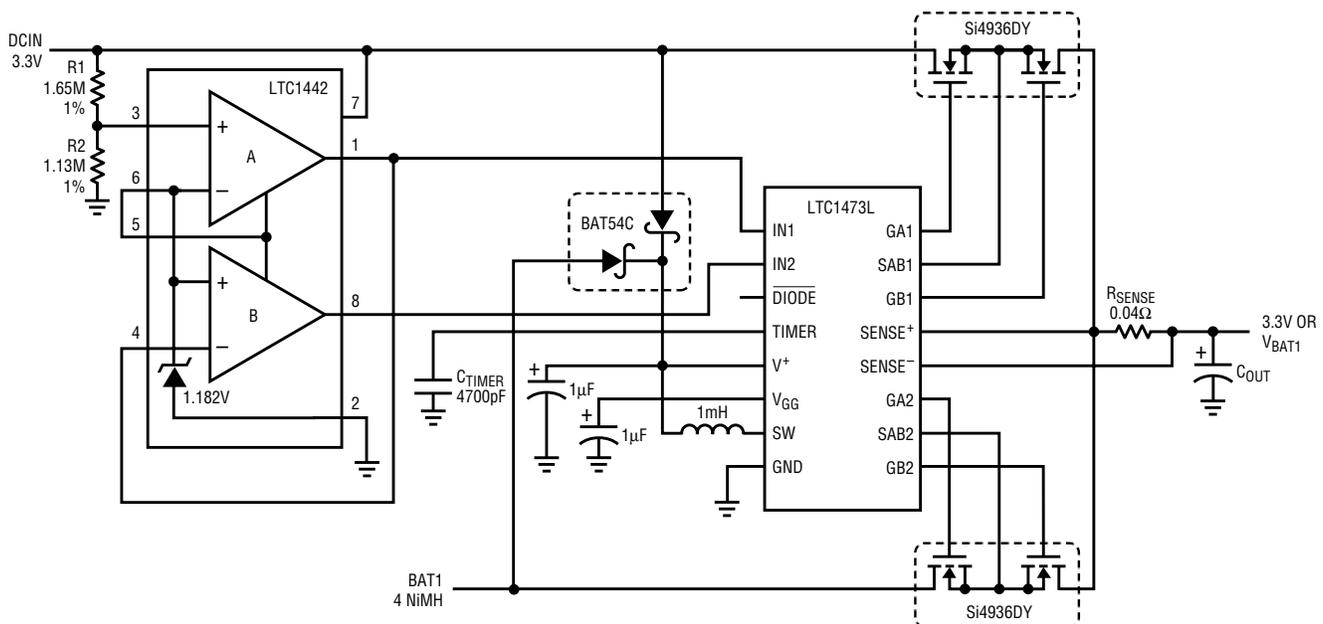


Figure 1. Automatic PowerPath switching for 3.3V applications

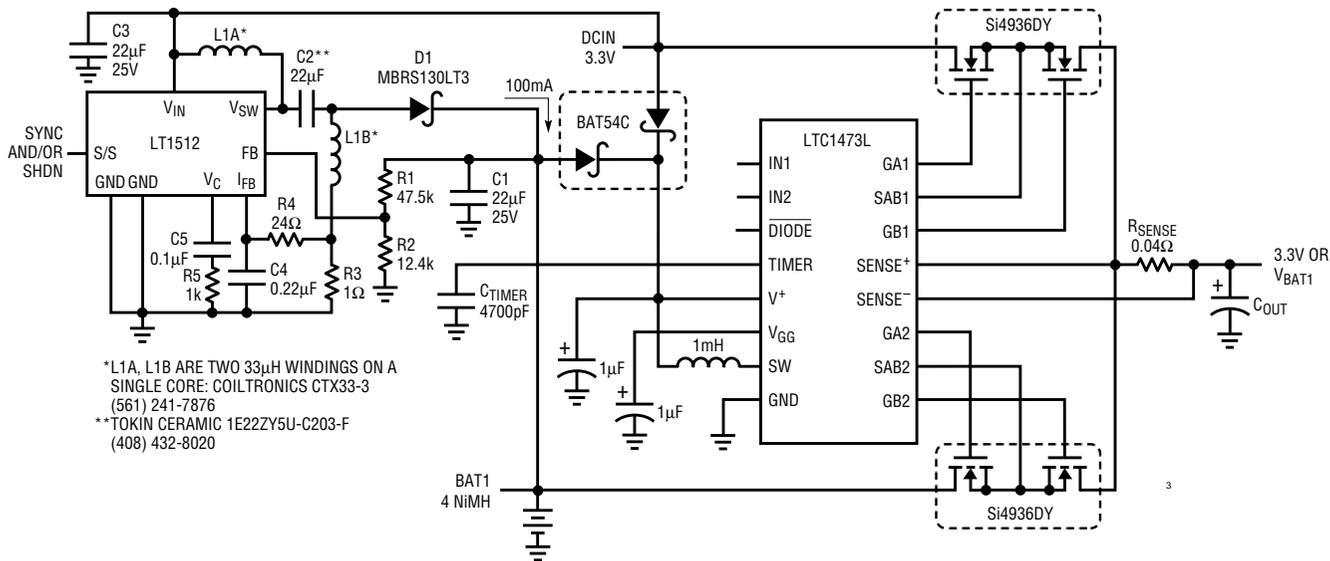


Figure 2. Battery-backup circuit with LT1512 battery charger

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the external NMOS switches are allowed to be in current limit, and the value of R_{SENSE} determines the inrush current limit, which is set at 2x to 3x of the maximum required output current.

When V^+ falls below 2.5V, the LTC1473L's undervoltage lockout circuit turns off both switches. With a

built-in hysteresis of 100mV, the LTC1473L becomes active again when V^+ rises above 2.6V. Therefore, for 3.3V systems, small Schottky diodes are used to power V^+ from both DCIN and BAT1 so that the undervoltage lockout circuit will not be falsely tripped. Since the LTC1473L has an I_Q of less than 100μA at 3.3V, the drop across the Schottky diode is less

than 0.4V, leaving enough room for a typical ±5% supply tolerance.

Glitch-free and seamless transition of power is crucial for maintaining normal operation in low voltage electronic equipment. The LTC1473L makes the transition transparent and trouble free. (For systems using supply voltages between 6V and 28V, refer to the LTC1473 data sheet.) 