Low-battery voltage cutoff consumes just 1 mA

YONGPING XIA, TELDATA INC, LOS ANGELES, CA

A low-battery voltage-cutoff circuit prevents overdischarge of a rechargeable battery. An obvious requirement of this circuit is extremely low power consumption. **Figure 1a**'s simple circuit has a measured current consumption of approximately 1.2 mA and uses only two components to perform the low-battery cutoff function for a four-NiCd battery.

IC_1 is a 3.9V voltage detector with a maximum hysteresis of 0.3V. When the battery is charged, the 5V power supply exceeds this IC's threshold such that its output goes high to turn on Q_1, an IRLZ14 MOSFET switch. The IRLZ14 is a logic-level device with an on-resistance of 0.2V. When the battery voltage drops to below IC_1's threshold, the output of IC_1 is zero, which turns off Q_1.

If the load is heavy, the circuit may turn on and off when the battery voltage reaches the threshold. When the circuit cuts off the load, the battery voltage rises again; this higher voltage may exceed IC_1's turn-on threshold. To prevent this problem, the circuit in **Figure 1b** uses a flip-flop to provide a clean cutoff. Pushing S_1 turns on the switch. When the load has a large capacitance, R_1 and C_1 provide a delayed response to prevent the turn-on in-rush current from triggering the circuit. The power consumption of this circuit is in the same range as that of the circuit pictured in **Figure 1a**.

All the parts for this idea are available from Digi-Key (www.digi-key.com). For a lower switch resistance, you can use the IRLZ44, which has an on-resistance of 0.022V. (DI #2253) e

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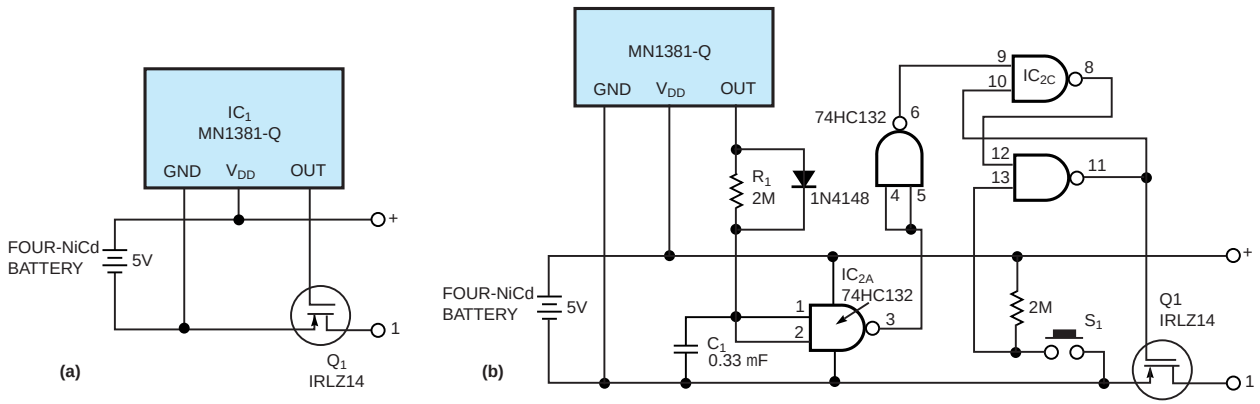
FIGURE 1



These low-battery-detect circuits cut off when the voltage is lower than 4V and consume approximately 1.2 mA.