DESIGN SHOWCASE

Regulated Step-Up Converter Provides High Efficiency Without Inductors

Two 8-pin ICs (**Figure 1**) form a regulator circuit that converts the 3V output of a lithium battery to 5V, and delivers load currents as high as 100mA. The circuit operates without inductors or transformers, and draws only 200µA of quiescent current. It offers 81% efficiency with a 100mA load and 84% with a 20mA load, at V_{IN} = 3V. The efficiency rises as V_{IN} falls. At V_{IN} = 2.7V, for example — the lithium cell's loaded output for most of its operating life — the efficiency for a 40mA load current is 90%.

Voltage from the lithium battery (a ⅔-A size Duracell DL123A) is doubled by the high-current charge pump IC_1. The Schottky diode (D_1) is included to assure startup in this configuration, and has no effect on efficiency because it doesn't conduct load current during normal operation.

IC_2 is a linear regulator whose dropout voltage is only 40mV at I_{LOAD} = 40mA. This load, allowed to drain the battery until V_{OUT} = 4.5V, yields a 16-hour battery life. Reducing the load to 20mA extends battery life to 36 hours.

(Circle 2)

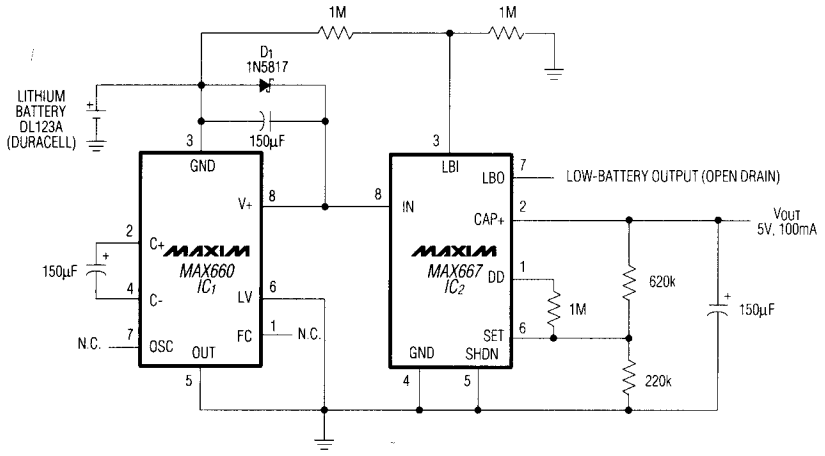

Figure 1. Operating without magnetic components, this circuit derives a regulated 5V from a 3V lithium battery and delivers load currents as high as 100mA.