DESIGN SHOWCASE

Uninterruptible 5V Supply Has Low Power Consumption

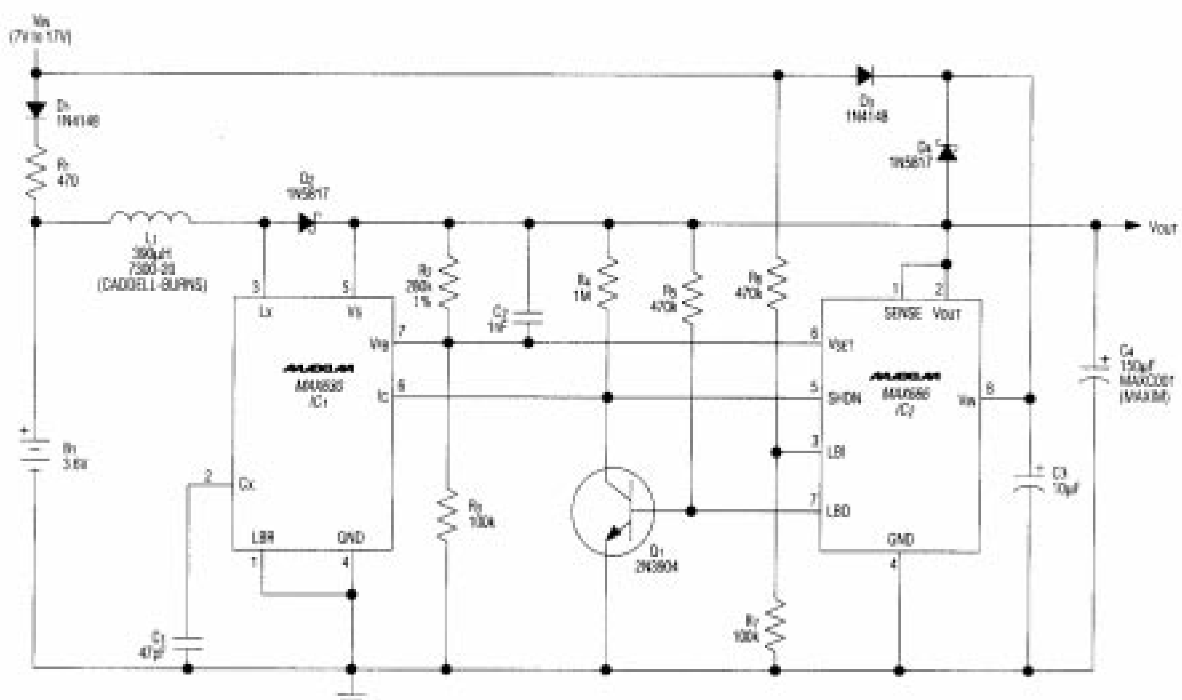
The uninterruptible power supply of Figure 1 combines a switching regulator with a linear regulator. When V_{IN} is above 7.3V, the switching regulator (IC_1) shuts down, the linear regulator (IC_2) generates V_{OUT}, and V_{IN} trickle charges the battery through D_1 and R_1. When V_{IN} drops below 7.3V, IC_2 shuts down and the step-up switching regulator takes over, generating 5V at 50mA from the 3.6V battery (three series-AA NiCd cells).

A 9V wall adapter supplies V_{IN}. IC_2 contains a low-battery detector circuit that senses V_{IN} by means of R_6 and R_7. The detector output (pin 7) drives an inverter (Q_1), which in turn drives the shutdown inputs I_C of IC_1 and SHDN of IC_2. These inputs have opposite-polarity active levels. The common feedback resistors R_2 and R_3 enable both regulators to sense V_{OUT}.

When IC_2 shuts down, its output turns off; but when IC_1 shuts down, the whole chip assumes a low-power state and draws less than 1µA. L_1, D_2, C_1, C_2, R_2, and R_3 are part of the 250mW switching regulator. Diodes D_3 and D_4 wire-OR the power connection to IC_2, and C_3 improves the linear regulator's load regulation.

When active, IC_1 provides an overall efficiency of 76% for load currents between 5 and 50mA. V_{IN} may range as high as 17V, but you should set the value of R_1 for a trickle charge of no more than 10% of the battery capacity, i.e. 0.1C.

(Circle 5)



Notes:
1. Use Ground Plane
2. Resistors are ±5% U.O.S.

Figure 1. Linear regulator IC_2 supplies 5V when V_{IN} is present; otherwise the step-up switching regulator IC_1 generates 5V from the battery. Thus, V_{OUT} remains constant whether V_{IN} is on or off.