Inductorless Switching Regulator Boosts Input Voltage

In conventional applications, switching-regulator ICs regulate V_{OUT} by controlling the current through an external inductor. The IC in Figure 1, however, driving a diode-capacitor network in place of the inductor, offers comparable performance for small loads. Made of readily available components, the network can double, triple, or quadruple the input voltage. Though somewhat less efficient than inductor-type regulators, the Figure 1 circuit offers equivalent line and load regulation.

Feedback from the R_1/R_2 voltage divider enables IC_1 to set the regulated-output level. (As shown, the circuit derives 12V from a 5-to-12V input and provides as much as 2mA of output current.) Adding a non-inverting MOS driver (Figure 2) boosts the available output current to 20mA.

No-load quiescent current is roughly proportional to V_{IN} for both circuits. Both draw 130µA at V_{IN} = 4.5V. At 12V, the Figure 1 circuit draws 225µA and the Figure 2 circuit draws 380µA. Full-load efficiency is highest for low V_{IN} in both cases: Efficiencies range from 74.4% at 4.5V to 36.8% at 12V (Figure 1), and from 72.4% at 4.5V to 43.9% at 12V (Figure 2).

(Circle 2)

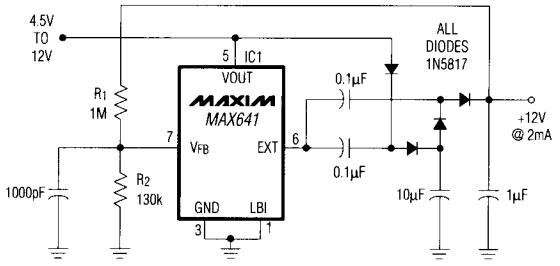

Figure 1. Substituting the diode-capacitor network shown for an inductor allows this switching-regulator IC to deliver 2mA at comparable line and load regulation, with somewhat reduced efficiency.

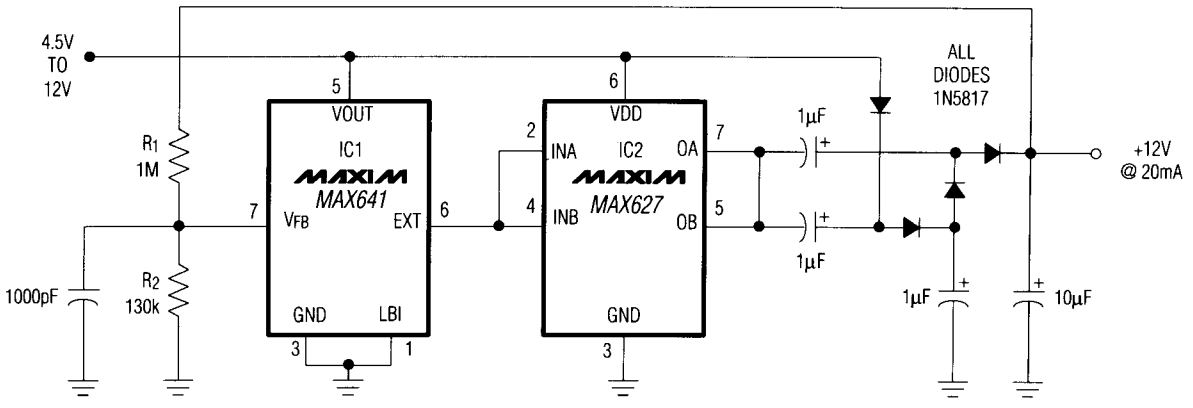

Figure 2. Introducing an MOS driver (IC_2) enables the Figure 1 circuit to deliver as much as 20mA.