Flyback Winding Adds 12V Output to 5V Buck Regulator

The buck-regulator switching converter of **Figure 1** is essentially a 5V supply with 200mA output capability. Adding the flyback winding on the main inductor (forming transformer T_1) enables an additional low-dropout linear regulator (IC_2) to produce the 12V output (V_{PP}) required for programming EEPROMs. The required input voltage is 8 to 16V.

Integrating the 12V supply with the main 5V supply is desirable in terms of size and cost. But some such schemes have drawbacks: A standard flyback converter with a multi-winding transformer, for example, must store large amounts of energy in the core, requiring a bulky transformer.

The buck converter with flyback winding is an optimum choice when stepping down to 5V from a relatively high-voltage battery pack. Compared with standard flyback converters, the stepdown/flyback approach offers a smaller transformer and considerably higher efficiency.

The main regulator (IC_1) includes most functions necessary for buck regulation, including a p-channel power MOSFET for the switching transistor. The transformer's winding polarities assure that current flows in the 12V secondary only during the primary's discharge cycle—a condition that applies 5V across the primary. This primary excitation is constant regardless of input voltage level, and assures good accuracy and good load regulation for the 12V output (provided you maintain a fairly heavy load on the 5V output).

You should also maintain a light minimum load on the 12V output to keep it from creeping up. Note that returning the secondary winding to 5V rather than ground results in fewer transformer windings and more power to the 12V load. You can switch the 12V output on and off via IC_2's SHDN input.

(Circle 5)

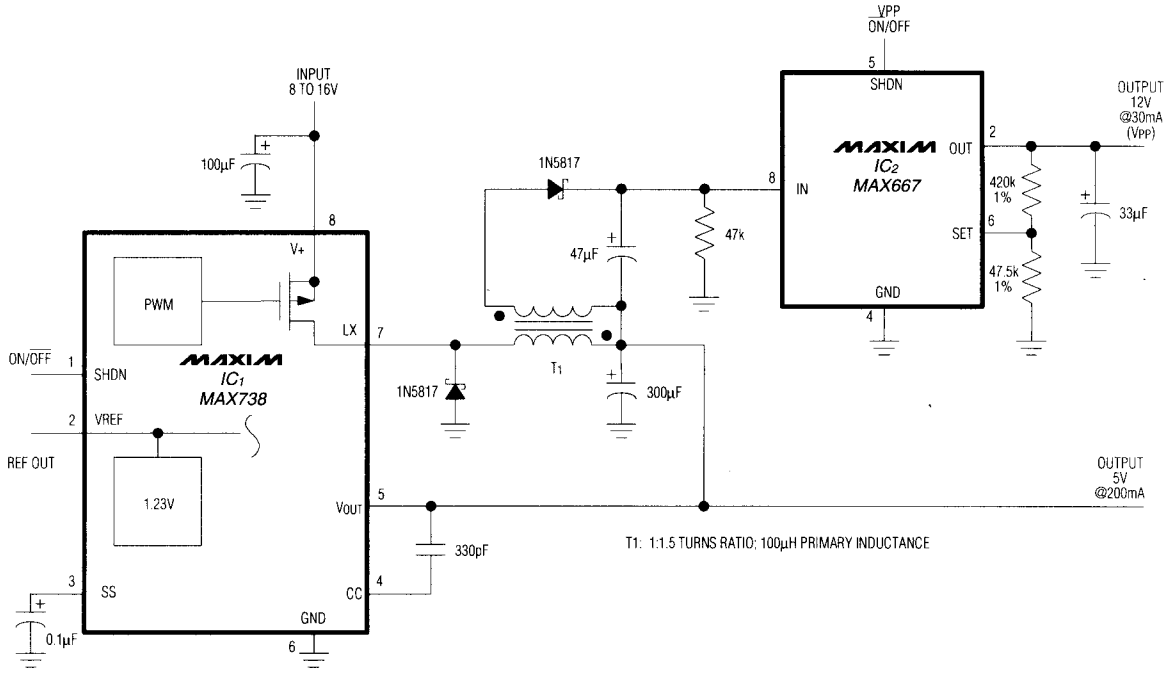

Figure 1. *A flyback winding on the inductor of this 5V regulator enables a second regulator (IC_2) to generate a 12V output.*