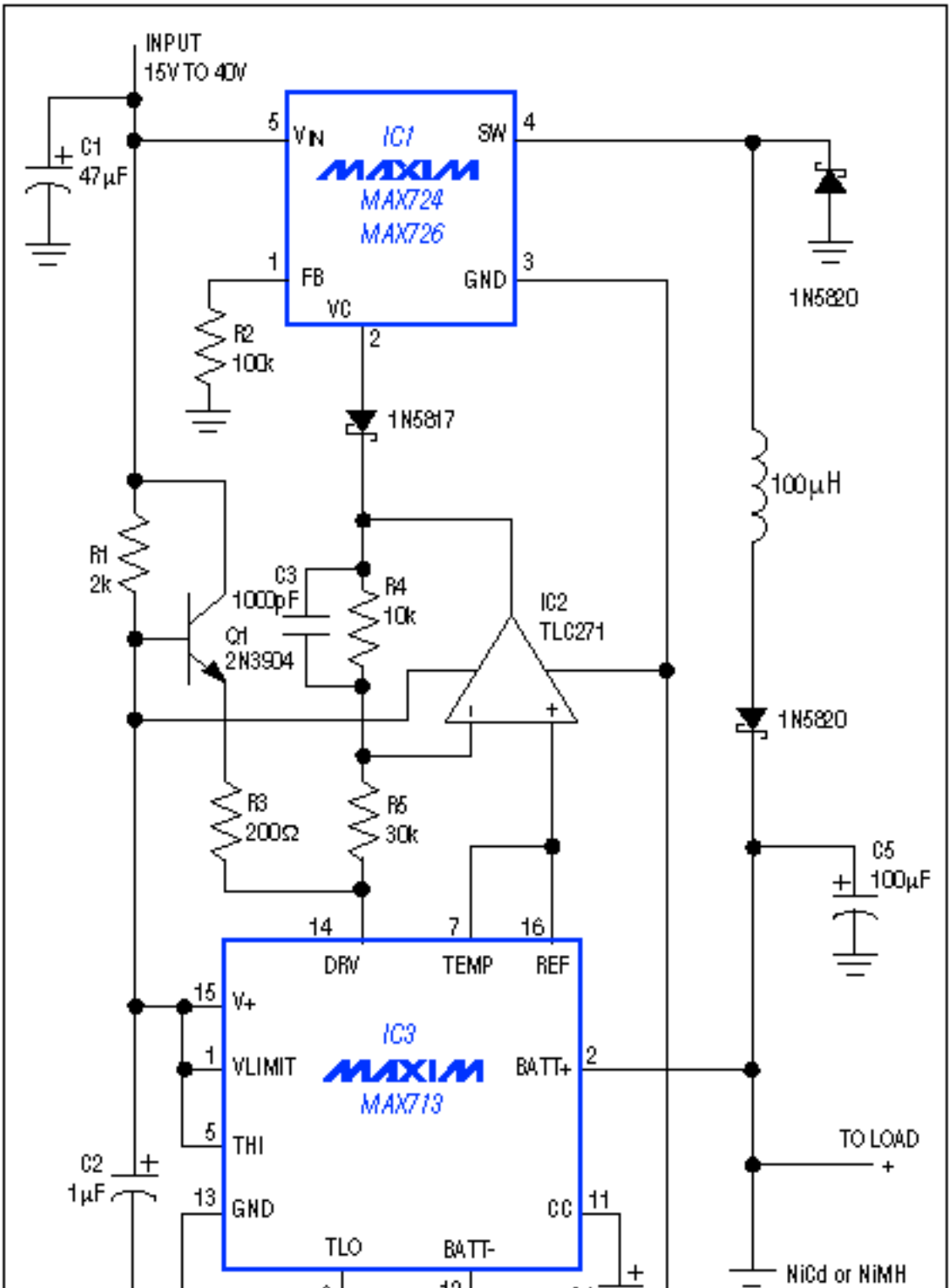
Switch-Mode Battery Charger Delivers 5A

The fast-charge controller IC3 **(Figure 1)** normally directs current to the battery via an external pnp transistor. In this circuit, the transistor is replaced with a 5A switching regulator (IC1) that delivers equivalent power with higher efficiency.



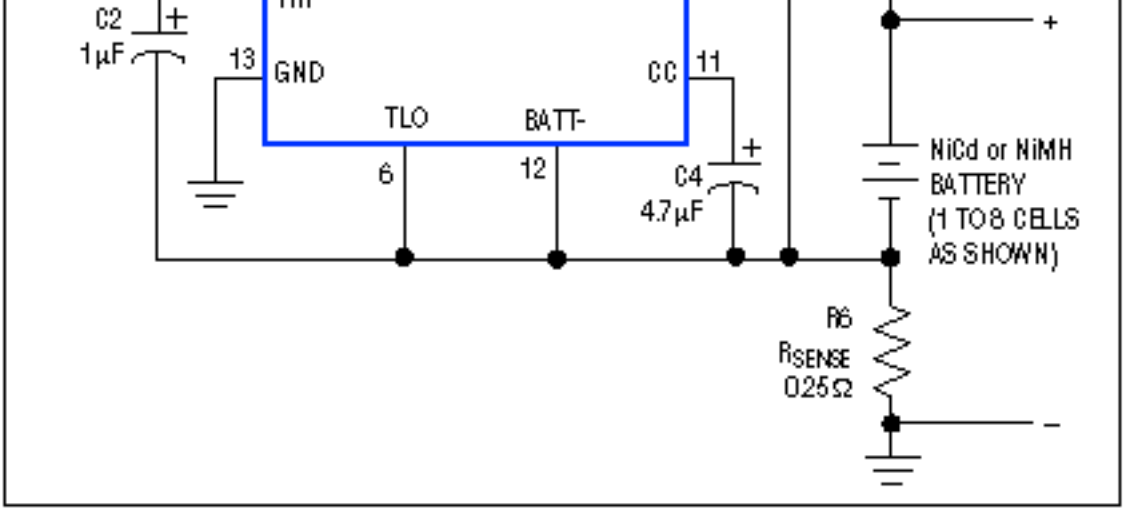


Figure 1. *By controlling the PWM duty cycle of switching regulator IC1, the fast-charge controller (IC3) makes efficient delivery of the battery's charging current.*

IC1 is a 5A buck switching regulator whose output is configured as a current source. Its internal power switch (an npn transistor) is relatively efficient because $V_{CE(SAT)}$ is small in comparison with the 15V-to-40V inputs. (For applications that require 2A or less, the low-saturation, non-Darlington power switch of a MAX726 offers better efficiency.)

R6 senses the battery-charging current and enables IC3 to generate an analog drive signal at DRV. The signal is first attenuated by the op amp to assure stability by reducing gain in the control loop. It then drives IC1's compensation pin (VC), which gives direct access to the internal PWM comparator. IC3 thus controls the charging current via the PWM duty cycle of IC1. The Q1 buffer provides current to the DRV input.

Loop stability is also determined by the feedback loop's dominant pole, set by C4 at the CC terminal of IC3. If you increase the value of the battery filter capacitor (C5), you should make a proportional increase in the value of C4. Lower values, however, assure good transient response. If your application produces load transients during the fast-charge cycle, check the worst-case response to a load step. To assure proper termination of the charge, battery voltage should settle within 2msec to 5mV times N (where N is the number of battery cells).

More Information

MAX713: QuickView -- Full (PDF) Data Sheet -- Free Samples