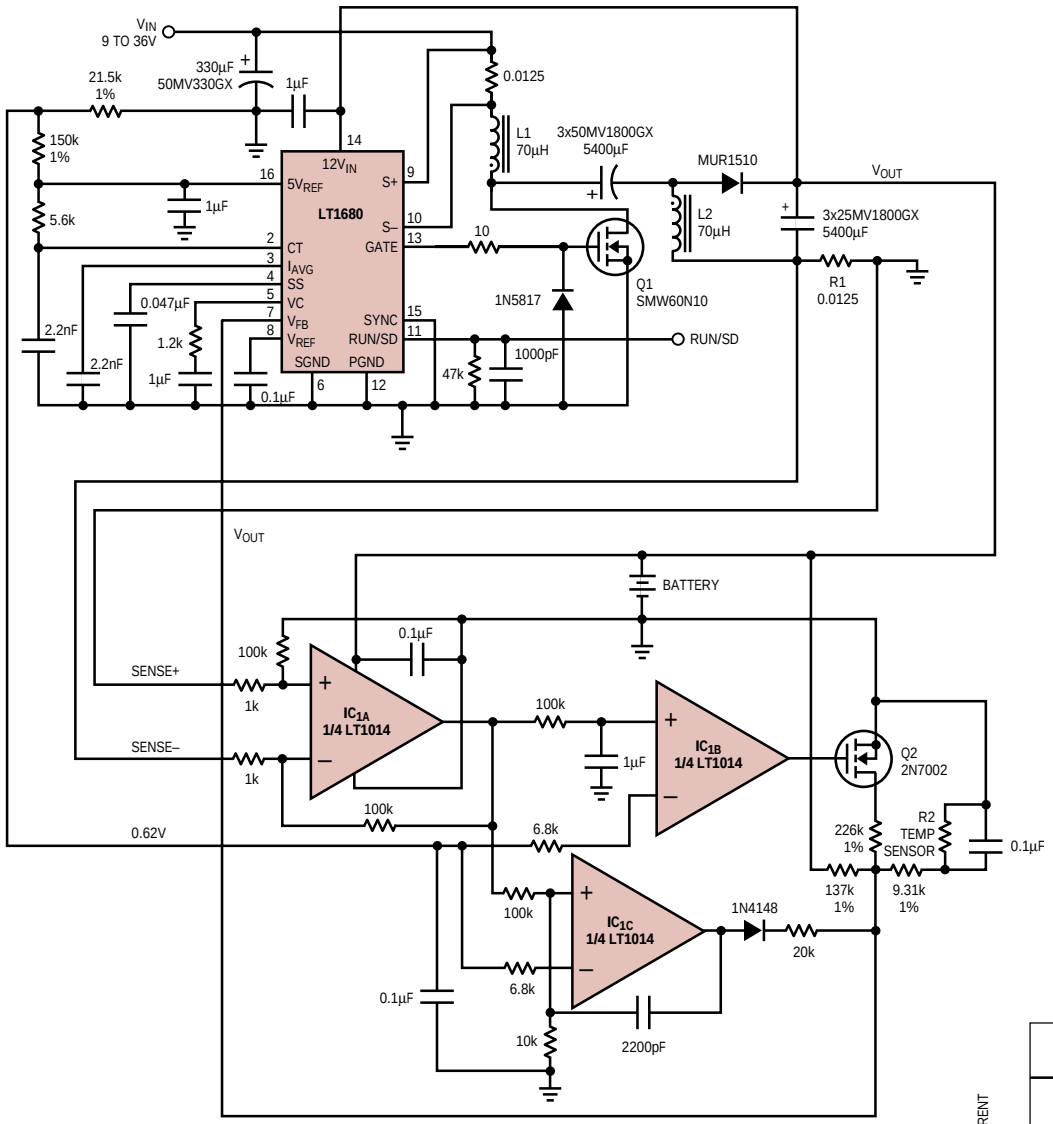
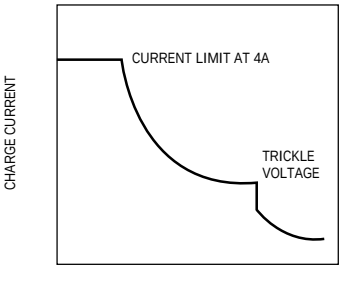
Dual-Rate SEPIC Charger for Sealed Lead-Acid Cells

The most common method for charging sealed lead-acid (SLA) batteries is constant-voltage charging. As the battery approaches full charge, the current drops off exponentially. The circuit below can charge seven D-cells with as much as 75W at the fast charge voltage (2.45V/cell) and automatically switches to a trickle-charge when the battery approaches full charge. The LT1680 current mode switching regulator is used as a constant-current, constant-voltage source and the LT1014 quad precision op amp is used to monitor the charge current and switch between the fast and trickle charge rates. The LT1680's current limit resistor is set to 4A to limit the initial constant-current rate into the discharged cells when charging is initiated. As the batteries continue to charge, the charge current decays exponentially, as shown. When the current decays to 0.5A, it produces a voltage drop of 6.25mV across the sense resistor, R_1. The LT1014 amplifies this voltage by 100, which trips the LT1014 comparator (IC_{1B}) and turns off Q_2.

This action lowers the feedback resistance and sets the lower float-charge voltage to 16.45V or 2.35V/cell. The charge voltage is automatically adjusted to compensate for changes in temperature by using a temperature sensor, R_2, to give a –3mV/°C/cell temperature coefficient. The battery can remain in this state indefinitely, preventing any degradation of battery life when charging for a long period of time.



NOTES:
Q1 AND D1 NEED HEAT SINKS.
L1 AND L2 = COILTRONICS CTX01 - 14002.



Source: LTC Applications Dept.
www.linear-tech.com/chargers.html