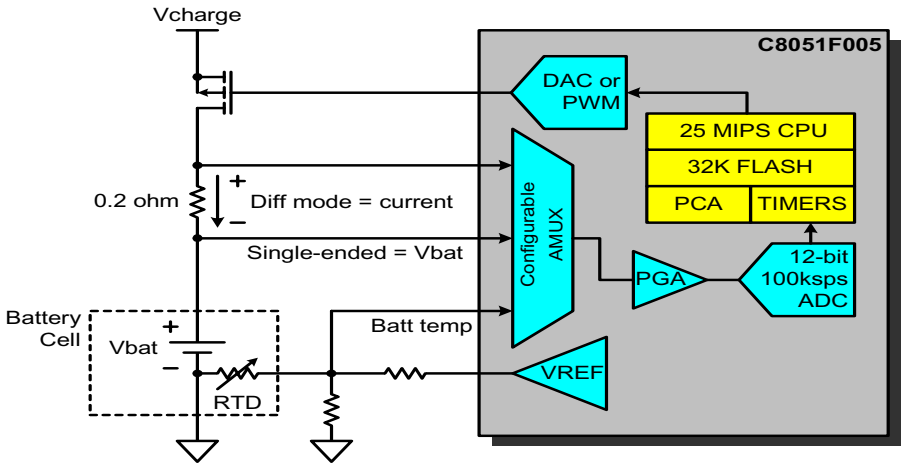
Battery Charger



Background

The high-level of integration, small form-factor, low-power consumption, and enhanced power-saving modes of Cygnal's C8051F005 device make it an ideal choice for use in embedded systems and hand-held devices.

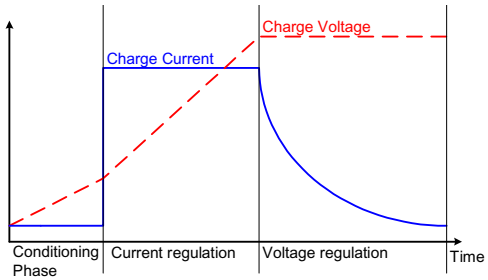
Driven by the need for untethered mobility and ease of use, many of these systems rely on rechargeable batteries as their primary power source. The battery charging circuitry for these systems is typically implemented using a fixed-function IC to control the charging current/voltage profile.

The C8051F005's high level of analog integration provides an alternate solution by allowing the system designer to implement the charging control function on-chip, with a few low-cost external components. This results in a system cost savings of $3 to $6 over applications using a fixed-function IC.

Cygnal Application

The optimum charging method is dependent on the battery chemistry (Li-Ion, NiMH, NiCd, etc.). However, most charging strategies implement a 3-phase scheme:

1. Low-current conditioning phase
2. Constant-current phase
3. Constant-voltage phase/charge termination



A DAC output (or alternately, a PWM output from the PCA) is used to control a pass transistor between the charging voltage and the battery cell. The charge current to the cell is monitored by taking a differential voltage reading across a small but accurate resistor (0.2Ω in the diagram above). The battery cell voltage and temperature are also monitored.

Key Benefits

- High-performance 12-bit ADC provides superior accuracy in monitoring charge voltage (critical to prevent overcharging in Li-Ion applications), maximizing charge effectiveness and battery life.
- On-chip PGA enhances resolution of differential current measurement. With a 2Ω resistor, the voltage gain is 200µV/mA; a PGA gain of 16 increases this resolution to 3.2mV/mA.
- On-chip VREF provides an accurate and stable drive voltage for determining battery temperature from the RTD (resistive temperature device).

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