Sequential Battery Discharge Control for LTC1760

Rev 1

By Mark Gurries

Introduction

The LTC1760, although based on the LTC1960 analog Dual Battery/Charger controller. The LTC1760 goes beyond the LTC1960 by adding a dedicated state machine which implements all the logic functions and SMBus functions needed to comply with the Smart Battery System Manager (SBSM) standard. http://www.sbs-forum.org/specs/sbsm100b.pdf

The SBSM Standard does not allowed the host access to any controls relating to direct power management manipulation or access to any charge parameters. The concern is a virus could be written to create some kind of dangerous situation dealing with batteries especially the Li-ion type. Without a host you can trust, the LTC1760 must act automatically and manage all power and charge management on its own. It can take suggestions from the host, but make up its own mind as to what to do. Safety is the number one goal.

The target application for the LTC1760 was notebook computers. In addition to providing a integrated controller solution for two batteries, new technology inside the LTC1760 is able to take full advantage of paralleling two large batteries in both charge and discharge. Advantages such as reducing I^2R losses inside the batteries such that total battery run life for the product was extended beyond what a sequential discharge would do under the same load conditions. An even bigger gain in reduction of total charge time can obtain in parallel charge modes compared to sequential charge process for batteries like Li-ion.

To that end, it was decided that the LTC1760 would work best if it always operated in parallel battery mode whenever two batteries are present. However, there are applications outside Notebook computers that actually need sequential battery control but still want to use the LTC1760. The following information will help you achieve that functionality.

Sequential Control

Unfortunately by design, there is no hidden control register to force sequential control via the SMBus. It must be forced on the LTC1760 with external hardware combined with some controller that translates the system configuration information into the correct sequential discharge mode. This is typically done with a host controller, which, through external I/O pins can accomplish.

The most important rule when working with the LTC1760 (or LTC1960 as required) is that you

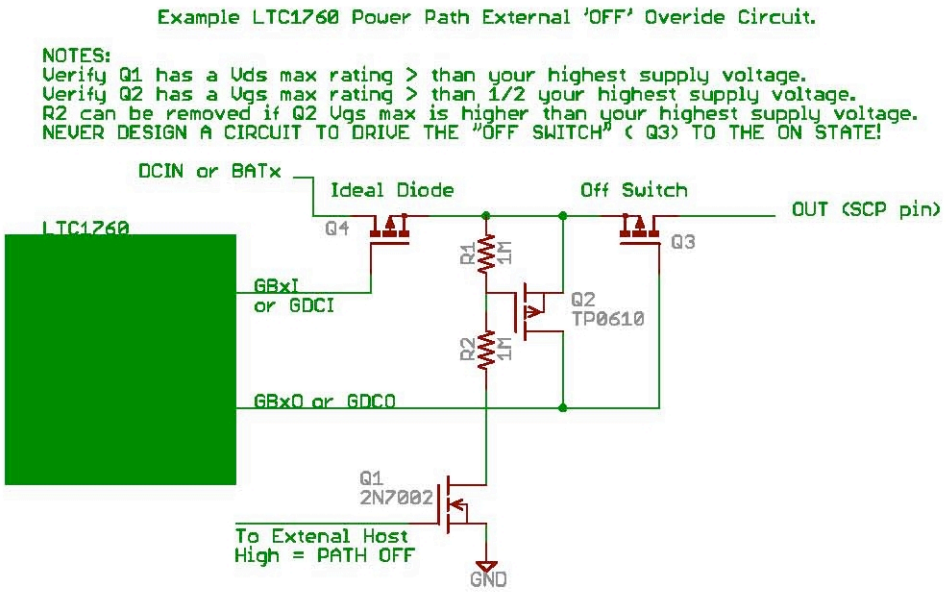
NEVER FORCE A GIVEN CHARGE or DISCHARGE POWER PATH ON.

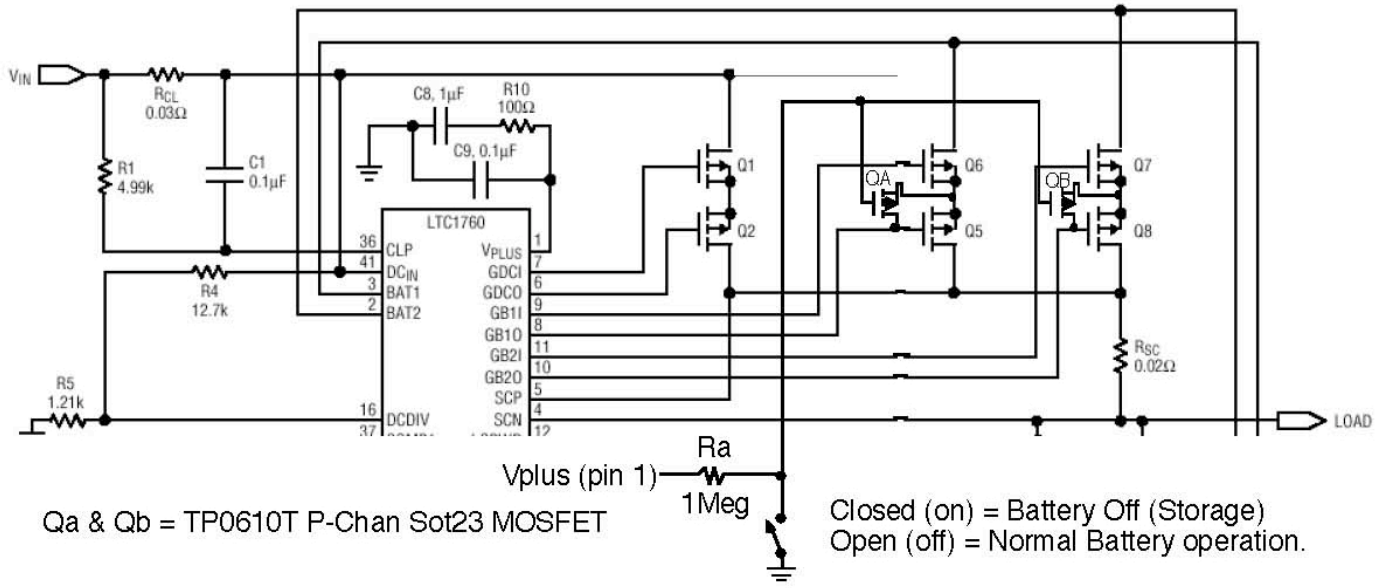
You create sequential control by doing the opposite and turn OFF the battery you wish to prevent being charged or discharged.

Why?

The LTC1760 and LTC1960 contain safety circuits that prevent power from being transferred between the three power sources (DCIN, BAT1 and BAT2) that are managed. The LTC1760 will only turn on devices in a safe manner and must always be left in control of what is turned on and how it is done. This means you can only control certain FETs and again only force them to the OFF State. To do otherwise risk uncontrolled current flow and what ever damage than can cause. With large batteries, explosions are not out of the question!

The following two diagram provide the details and concepts behind the implementation.





Linear Technology has made a best effort to design a circuit that meets customer-supplied specifications; however, it remains the customer's responsibility to verify proper and reliable operation in the actual application. Component substitution and printed circuit board layout may significantly affect circuit performance or reliability. Contact Linear Technology Applications Engineering for assistance.