LINEAR TECHNOLOGY

DESIGN NOTES

Dual Smart Battery Charger Simplifies Battery Backup for Servers

Design Note 342

Mark Gurries

Introduction

Smart Batteries are an increasingly popular choice for more than just traditional compact consumer electronic devices. For example, Smart Batteries are being used as battery backup for products such as blade servers, where knowing battery status is very important.

LTC1760 Dual Smart Battery Charger

Figure 1 shows a typical dual battery charger. This circuit can charge batteries with up to 4A and switch continuously down to zero load currents. This circuit takes advantage of ceramic capacitors' space saving features without pro-

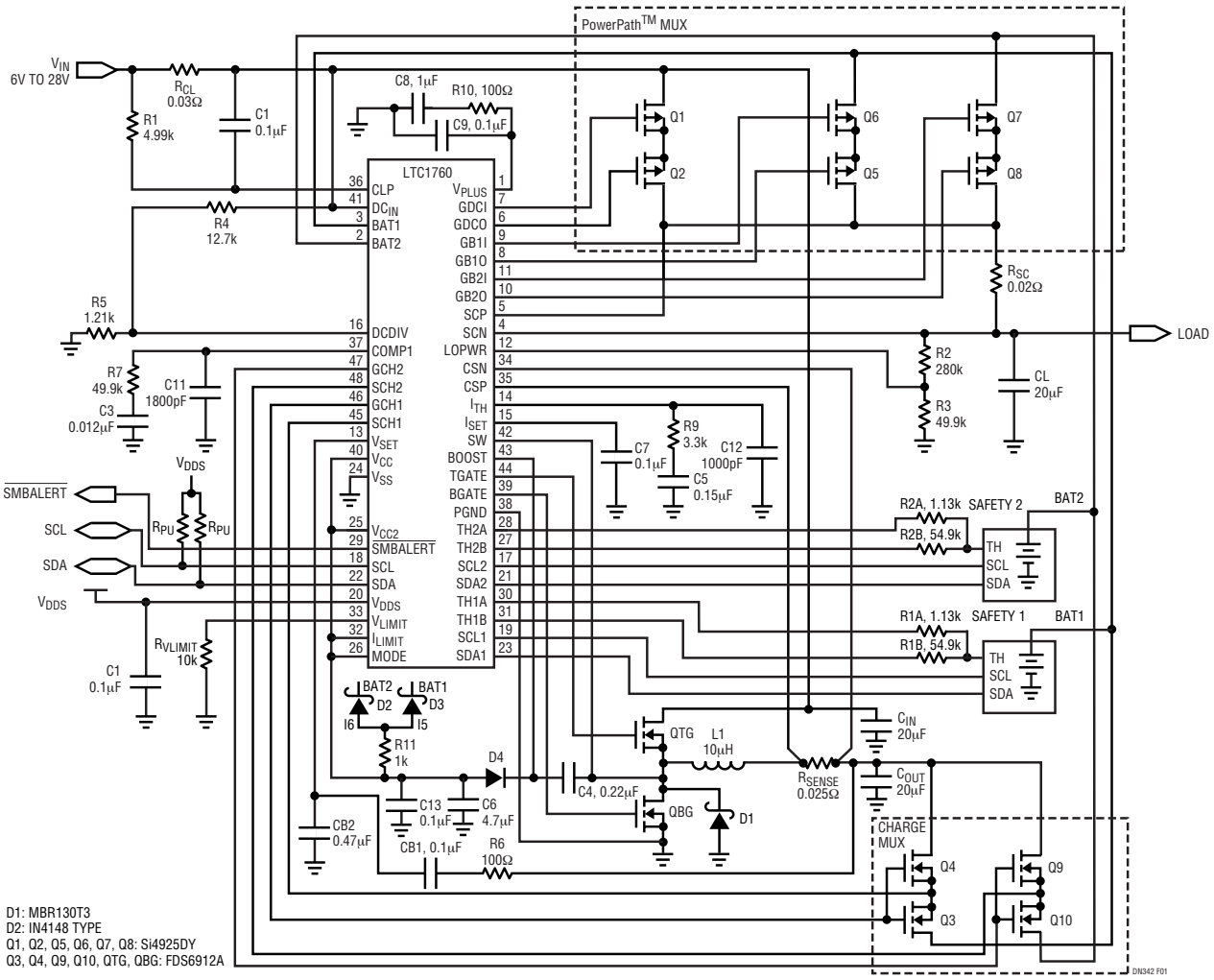

Figure 1. 4A Dual Battery System

ducing any audible noise. The high 300kHz switching frequency allows the use of small low cost 10μH inductors.

The LTC1760 complies with the Smart Battery System Manager (SBSM) specification V1.1. It has a very wide input and charge output voltage range of 6V to 28V. Current and voltage accuracies of 0.2% of the reported values provide precision charge capability. Low dropout is achieved with 99% maximum duty cycle while maintaining efficiency greater than 95%. The LTC1760 also offers many unique features, including a special current limit and voltage limit system that prevents SMBus data corruption errors from generating false charge values, which could harm the battery. An SMBus accelerator increases data rates in high capacitance traces while preventing bus noise from corrupting data*.

Other features include: an AC present signal with precision 3%-accurate user adjustable trip points; a safety signal circuit that rejects false thermistor tripping due to ground bounce caused by the sudden presence of high charge currents, and an ultrafast overvoltage comparator circuit that prevents voltage overshoots when the battery is suddenly removed or disconnects itself during charge. Last but not least is an input current limit sensing circuit that limits charge current to prevent wall adapter overload as the system power increases**.

LTC1760 Power Management

Dual battery systems are traditionally used to simply extend system battery run time by allowing a sequential battery drain—drain battery 1, then battery 2. New server applications are also using batteries and demand drain currents beyond the capability of a single battery.

The LTC1760 addresses this need by allowing the safe parallel discharge of two batteries. Parallel discharge offers more than just increased current capability. It reduces I^2R losses and improves voltage regulation under extremely high load conditions, both of which can improve total discharge time over a sequential solution. Figure 2 compares discharge times for equivalent parallel and sequential solutions. In high current, rapid discharge applications, quick recharging of the batteries is a priority. Again the LTC1760 goes beyond the simple sequential solution and offers *parallel charging*, which, depending on the battery chemistry, can result in significant charge time reductions over a sequential solution, as shown in Figure 3.

Safely managing the charge and discharge states of multiple batteries and the DC input power source presents a significant power management issue that historically has involved a host processor running custom written application software. The LTC1760 simplifies this task by operating in a standalone Level 3 Bus Master mode. It autonomously controls simultaneous battery charging and discharging, full dual battery conditioning support and ideal diode PowerPath™ switching between two batteries and a wall adapter *without requiring any host processor*.

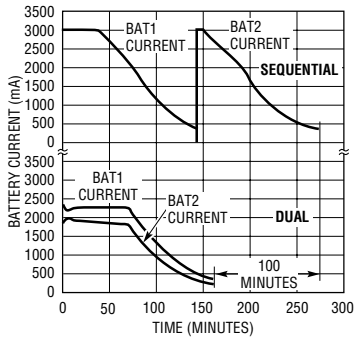

Figure 2. Dual Battery vs Sequential Battery Charge Time

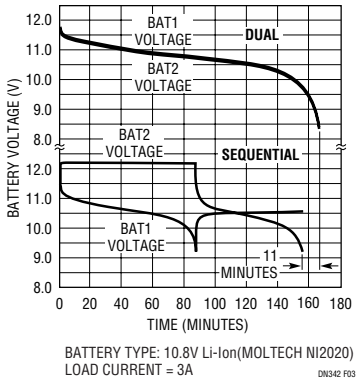

Figure 3. Dual Battery vs Sequential Battery Discharge Time

Data Sheet Download

http://www.linear.com

For applications help,
call (408) 432-1900, Ext. 2593

Linear Technology Corporation
1630 McCarthy Blvd., Milpitas, CA 95035-7417
(408) 432-1900 • FAX: (408) 434-0507 • www.linear.com

dn342f LT/TP 1004 344K • PRINTED IN THE USA