XR-8100/8100L

Intelligent Battery Management Systems

...the analog plus company™

October 1996-2

FEATURES

- Changes in Battery Capacity Are “learned”
- Analog Capacity Indication
- Digital Interface Includes Async Or 2 Or 3 Line Sync Communication, SBD, or Custom
- Algorithm Allows for Multiple System Coefficients for Charge, Discharge, And Self Discharge Calculations
- On board 12 Segment LED/LCD Drivers
- Calibration and Service Flags
- Compatible with Lead Acid, Ni-Cd, NI-MH, and Li-Ion
- Coulomb Counter for Charge Measurement
- Cycle Counter and History Data Retention
- Three Types of Charger Control
- Six Types of End of Charge Detection
- Li-Ion Protection

FUNCTIONS

- System Monitors Shift in Capacity as Cells Age
- Provides an Analog Signal Proportional to Capacity
- Three Modes of Communication For Maximum Flexibility
- Compensates for Temperature, Capacity, and Flow Rates in all Calculations
- Allows for On-board Indication of Capacity and Status
- Notifies User or Host of a Calibration Or Service Condition
- Minimizes System Redesign Efforts
- Monitors System Current Flow
- User and OEM Can Track Age and Usage of Battery Lower Warranty Costs
- Analog, Digital, and Communications Channels
- dT/dt, -ΔV, TCO, VCO, Min. I, and Backup Timer
- Protects for Cell Over/Under Voltage Conditions

GENERAL DESCRIPTION

The EXAR Intelligent Battery Management system is designed as a chipset. The chipset consists of a digital ASIC, an analog front end, and for LI-Ion systems, a LI-Ion protection IC. The XR-8100 chipset is used for NI-Cd and NI-MH systems, and it consists of the XR-8101 and XR-8115. For LI-Ion applications, the XR-8105 LI-Ion protection chip monitors each cell and disconnects the load or charge current as required. With the addition of the XR-8105, the chipset is known as the XR-8100L.

The EXAR Intelligent Battery Management System monitors critical battery parameters to produce a highly accurate state-of-charge indication and to control slave charging systems. It is compatible with lead acid, Ni-Cd, NI-MH, & Li-Ion technologies.

By providing charger control, fuel gauge display drivers, and both a digital and analog interface, the XR-8100 allows both the OEM and user maximum flexibility and performance. The combination of these features makes it the most comprehensive and flexible system in the market today.

Combined with the battery and applications experience of Anton/Bauer, Inc., a direct solution to the most demanding portable power applications can be achieved in the shortest time possible.

Benefits

With the incorporation of the EXAR XR-8100 Intelligent Battery Management System, manufacturers can provide their end users the most reliable, highest quality, portable power system available today. The advanced logic in the XR-8100 monitors critical parameters and actually “learns” cell capacity changes over time. The XR-8100 can interface with intelligent charging systems, or it can take control of a DC power source to provide the optimum charging profile for lead acid, Ni-Cd, NI-MH, and Li-Ion cells. The multiple interfaces provide for maximum system flexibility, while the on board display drivers allow

EXAR Corporation, 48720 Kato Road, Fremont, CA 94538 ◆ (510) 668-7000 ◆ FAX (510) 668-7017

for local display of capacity when a battery pack is removed from the host system.

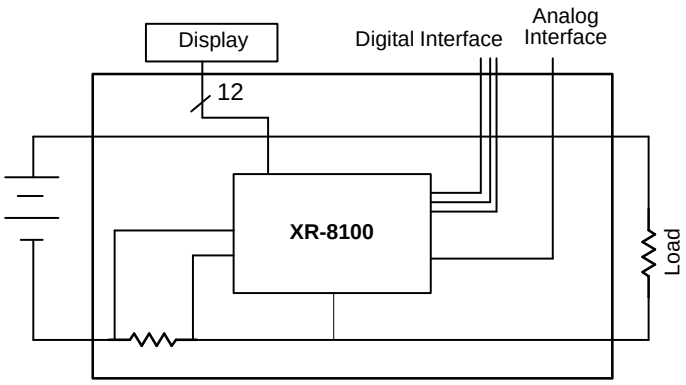

Figure 1. XR-8100 System Block Diagram

Product Packaging

The XR-8100 is a two chip set for NI-Cd/NI-MH applications which allows for a high performance, high integration solution. Married with few peripheral components, it occupies minimal board space.

ORDERING INFORMATION

Please refer to individual datasheets for ordering information.

Communication

As the market has developed, many communication protocols have been established. No one communications protocol covers all the needs of a system. The robust protocols provide much information, but at a higher system cost. The simple protocols don't communicate enough information for some applications.

The EXAR XR-8100/8100L Battery Management System supports a variety of standard protocols. A command-response protocol is transmitted over asynchronous or a synchronous 2 or 3 wire interface, the new SBD standard, or a fully custom proprietary interface.

Since the EXAR XR-8100/8100L Battery Management System employs separate digital and analog ASICs, changing protocols is simply a matter of changing one small IC, with all other components (and the PC board layout) remaining the same. In addition, custom protocols can be easily developed, giving the design engineer additional flexibility and the protection enjoyed by having a proprietary interface.

EXAR's I–COMM™ Technology defines a standard one line, async communications mechanism, and a standard power supply interface for charging. This allows system designers to take advantage of the object oriented nature of the battery management system design. With this technology, a designer can implement single or multiple chemistry designs, and receive critical battery parameters.

Li-Ion (XR-8100L)

Li-Ion cells require a protection system to monitor for overcharge or over-discharge conditions on each cell in the stack. The XR-8100L system monitors the voltage on each cell without affecting the cell pack balance. If any cell voltage rises above a preset voltage or drops below a preset voltage, the battery pack is automatically disconnected from the terminals, thus protecting the cells from damage and the user from any harm.

Charge Cutoff Methods

The XR-8100/8100L supports all standard cutoff methods. The system will terminate charge on maximum voltage, maximum change in temperature, maximum temperature, a minus change in voltage, a minimum current, or a maximum time. The proper cutoff method is chosen based upon cell type.

In addition, the XR-8100/8100L supports a pack balancing algorithm, and self discharge compensation "maintenance" algorithms, where appropriate. This ensures maximum battery capacity after removal from the charger.

For additional information please consult the XR-8101 datasheet.

Fuel Gauge

The XR-8100/8100L employs a sophisticated analog front end and a proprietary algorithm to produce the most accurate fuel gauge indication available in the marketplace today. With multiple self discharge parameters selected by battery environment and condition, and a learning system with non volatile data storage, the XR-8100/8100L fuel gauge accurately indicates state of charge.

Battery Life and Maintenance

As the battery ages, the fuel gauge will track the available capacity. In addition, the XR-8100/8100L chipset maintains a count of cycles and time since last calibration. The XR-8100/1800L also maintains “service required” and “calibration required” flags, which can be displayed and/or commonized to alert users of problems before they find themselves without battery power.

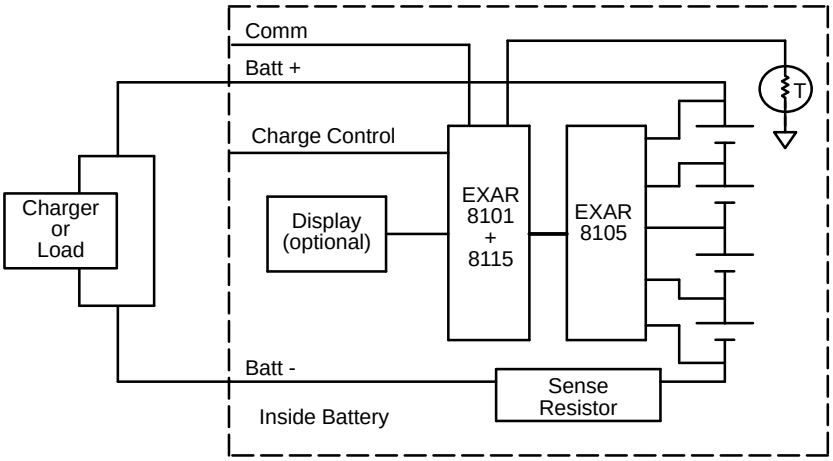

Figure 2. Battery Application Block Diagram (A) for LI-ION

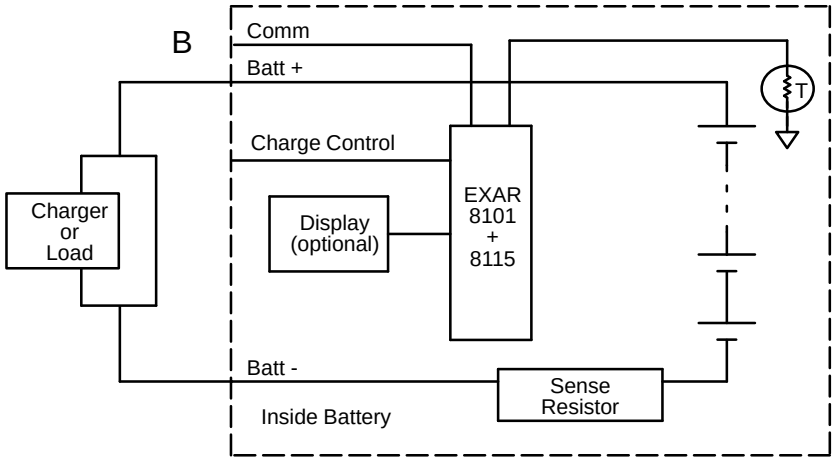

Figure 2. Battery Application Block Diagram (B) for NI-Cd/NI-MH

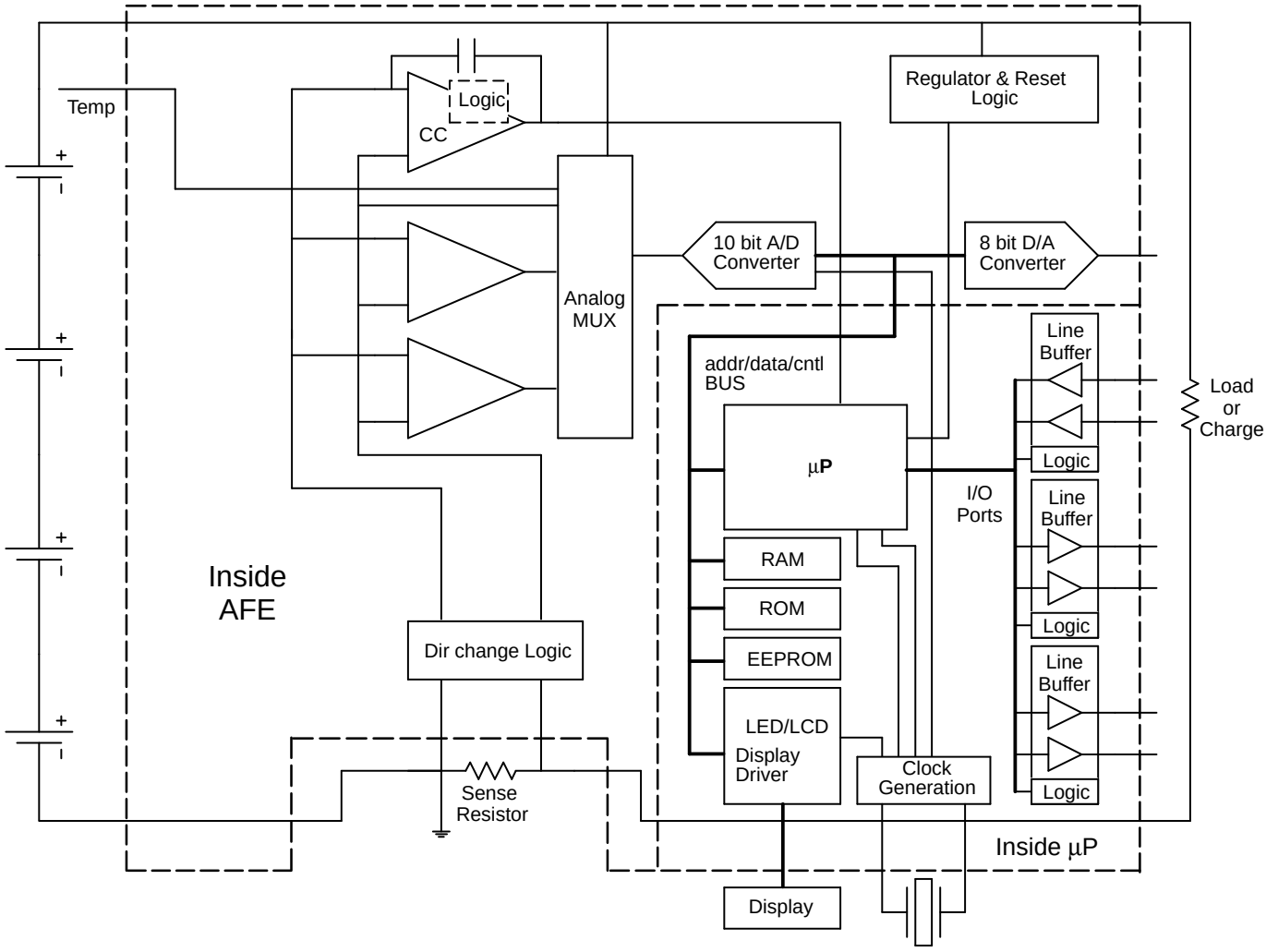

Figure 3. Intelligent Smart Battery Management System

Notes

Notes

NOTICE

EXAR Corporation reserves the right to make changes to the products contained in this publication in order to improve design, performance or reliability. EXAR Corporation assumes no responsibility for the use of any circuits described herein, conveys no license under any patent or other right, and makes no representation that the circuits are free of patent infringement. Charts and schedules contained here in are only for illustration purposes and may vary depending upon a user's specific application. While the information in this publication has been carefully checked; no responsibility, however, is assumed for inaccuracies.

EXAR Corporation does not recommend the use of any of its products in life support applications where the failure or malfunction of the product can reasonably be expected to cause failure of the life support system or to significantly affect its safety or effectiveness. Products are not authorized for use in such applications unless EXAR Corporation receives, in writing, assurances to its satisfaction that: (a) the risk of injury or damage has been minimized; (b) the user assumes all such risks; (c) potential liability of EXAR Corporation is adequately protected under the circumstances.

Datasheet October 1996