UNITRODE

bq2150

Li-Ion Power Gauge™ Module

Features

- Complete bq2050 Power Gauge solution for Li-Ion battery packs
- Battery information available over a single-wire bidirectional serial port
- Battery state-of-charge monitoring for 2- to 4-cell series applications
- On-board regulator allows direct connection to the battery
- "L" version includes push-button activated LEDs to display state-of-charge information
- Nominal capacity pre-configured
- Compact size for battery pack integration

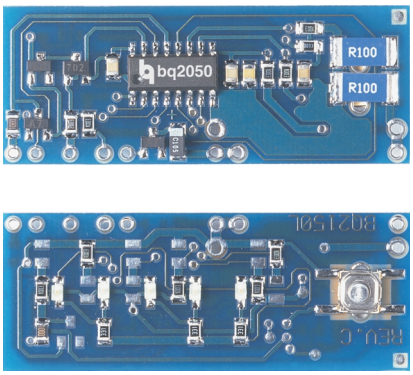
General Description

The bq2150 Power Gauge Module provides a complete and compact solution for capacity monitoring of Li-Ion battery packs. Designed for battery pack integration, the bq2150 incorporates a bq2050 Gas Gauge IC, a current sense resistor, and all other components necessary to accurately monitor and display the capacity of 2 to 4 series cells.

The bq2150L includes five LEDs to display remaining capacity in 20% increments of the learned capacity. The LEDs are activated with the onboard push-button switch.

Contacts are provided on the bq2150 for direct connection to the battery stack (BAT+, BAT-) and the serial communications port (DQ). The RBI input provides backup power to the bq2050 in the event that the cells are removed or the battery is turned off. The bq2150 has a 1µF capacitor onboard connected to RBI to supply backup power for about an hour. In battery packs that use high-side FETs to control the charge/discharge of the Li-Ion cells, the RBI input can be wired to a single cell to provide prolonged data retention times. The SD input allows an external signal (active low) to turn the bq2050 IC off to minimize internal current consumption of the battery pack and maximize storage life of the pack in the system. When turned off, the bq2050 is nonfunctional, and the RBI power source maintains register information. Please refer to the bq2050 data sheet for the specifics on the operation of the gas gauge.

Unitrode configures the bq2150 based on the information requested in Table 1. The configuration defines the number of series cells, the nominal battery pack capacity, and the Li-Ion battery type (coke or graphite anode). Figure 1 shows how the module connects to the cells.



A module development kit is also available for the bq2150. The bq2150B-KT or the bq2150LB-KT includes one configured module and the following:

1) An interface board that allows connection to the serial port of an AT-compatible computer.
2) Menu-driven software to display charge/discharge activity and to allow user interface to the bq2050 from any standard DOS PC.
3) Source code for the TSR.

Pin Descriptions

P1	**DQ/Serial Communications port**
P2	**No connect**
P3	**BAT+/Battery positive/pack positive**
P4	**SD/Shutdown**
P5	**RBI/Register backup input**
P6	**GND/Ground**
P7	**PACK-/Pack negative**
P8	**BAT-/Battery negative**

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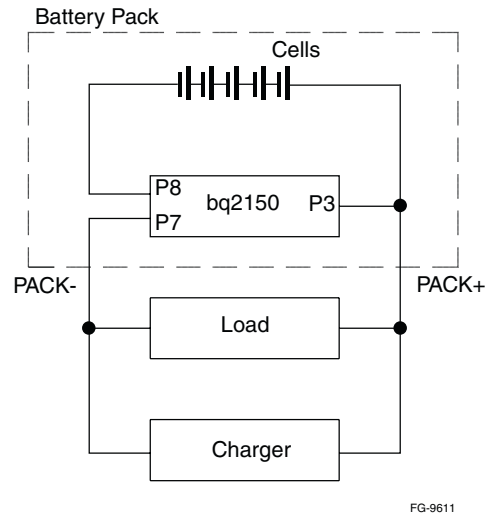


Figure 1. Module Connection Diagram

Table 1. bq2150 Module Configuration

Customer Name: _____

Contact: _____ Phone: _____

Address: _____

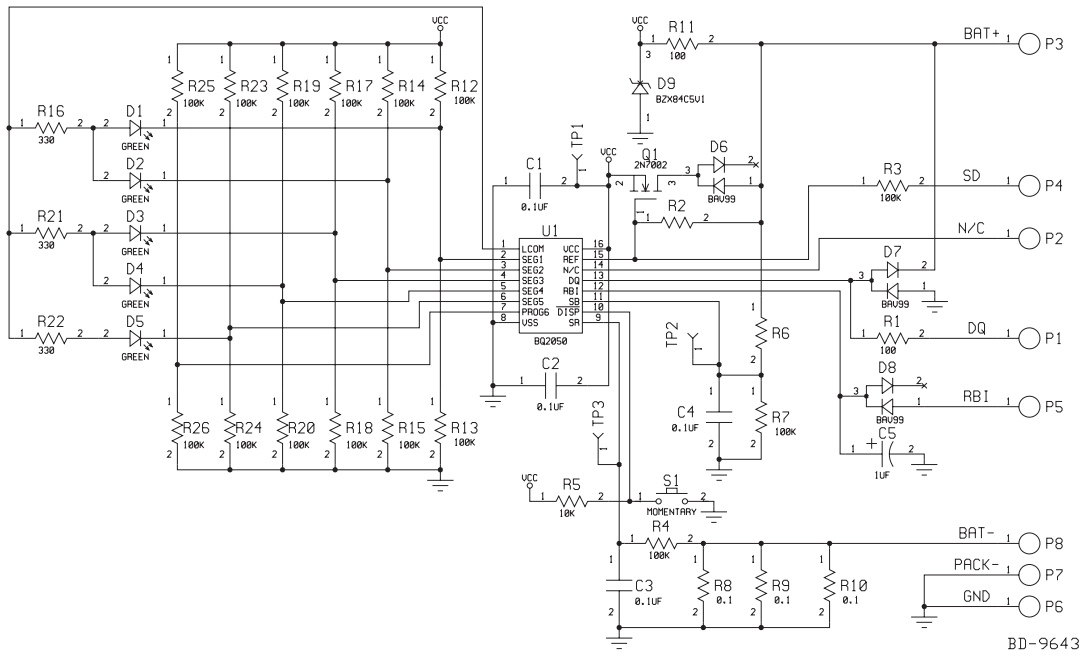
_____

Sales Contact: _____ Phone: _____

Number of series battery cells (2-4)	_____
Coke or graphite cell anode	_____
Battery pack capacity (mAh)	_____
Discharge rate into load (3.0A max)	Min. _____ Avg. _____ Max. _____
Charge rate (3.0A max)	_____
Nominal Available Capacity after reset (Programmed Capacity or Zero)	_____
Self-discharge compensation (Y/N)	_____
LEDs and switch (Y/N)	_____

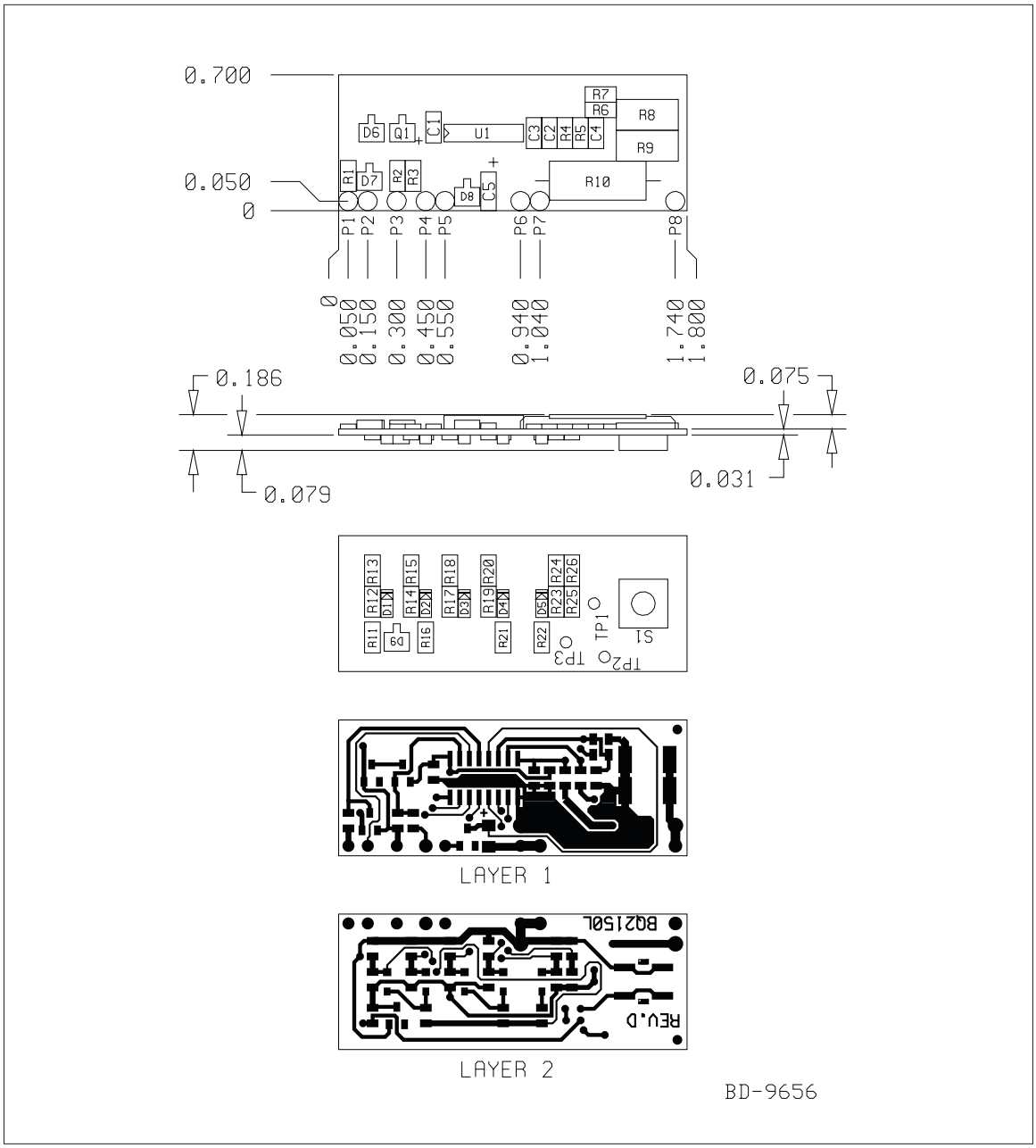
FAE Approval:_____ Date:_____

bq2150 Schematic



Note: Schematic shows components that may not be placed on the board, depending on the configuration.

bq2150 Board



Absolute Maximum Ratings

Symbol	Parameter	Minimum	Maximum	Unit	Conditions
V_{CC}	Relative to V_{SS}	-0.3	+7.0	V	bq2050
All other pins	Relative to V_{SS}	-0.3	+7.0	V	bq2050
P_{SR}	Continuous sense resistor power dissipation	-	3	W	Thru-hole sense resistor
		-	1	W	Surface-mount sense resistor
I_{CHG}	Continuous charge/discharge current	-	3.0	A	
T_{OPR}	Operating temperature	0	+70	°C	Commercial
T_{STR}	Storage temperature	-40	+85	°C	

Note: Permanent device damage may occur if **Absolute Maximum Ratings** are exceeded. Functional operation should be limited to the Recommended DC Operating Conditions detailed in this data sheet. Exposure to conditions beyond the operational limits for extended periods of time may affect device reliability.

DC Electrical Characteristics ($T_A = T_{OPR}$)

Symbol	Parameter	Minimum	Typical	Maximum	Unit	Conditions/Notes
NumCell	Number of series cells in battery pack	2	-	4	-	
BAT+	Positive terminal of pack	GND	NumCell * 3.6V	NumCell * 5.4V	V	
BAT-	Negative terminal of pack	GND - 0.3	-	GND+2.0	V	
I_{CC}	Supply current at BAT_{1P} terminal (no external loads)	-	200	300	µA	
R_{DQ}	Internal pull-down	500k	-	-	Ω[1]	
I_{OL}	Open-drain sink current DQ	-	-	5.0	mA[1]	
V_{OL}	Open-drain output low, I_{OL} DQ	-	-	0.5	V[1]	I_{OL} < 5mA
V_{IHDQ}	DQ input high	2.5	-	-	V[1]	
V_{ILDQ}	DQ input low	-	-	0.8	V[1]	
V_{OS}	Voltage offset	-	-	150	µV[1]	

Note: 1. Characterized on PCB, IC 100% tested.

DC Voltage Thresholds ($T_A = T_{OPR}$)

Symbol	Parameter	Minimum	Typical	Maximum	Unit	Notes
V_{EDVF}	Final empty warning	1.45	1.47	1.49	V	BAT+/(2*NumCell)[1]
V_{EDV1}	First empty warning	1.50	1.52	1.55	V	BAT+/(2*NumCell)[1]
V_{MCV}	Maximum single-cell voltage	2.20	2.25	2.30	V	BAT+/(2*NumCell)[1]
V_{SRO}	Sense range	-300	-	+2000	mV	SR, $V_{SR} + V_{OS}$[2]
V_{SRQ}	Valid charge	210	-	-	µV	$V_{SR} + V_{OS}$ [2, 3]
V_{SRD}	Valid discharge	-	-	-200	µV	$V_{SR} + V_{OS}$ [2, 3]

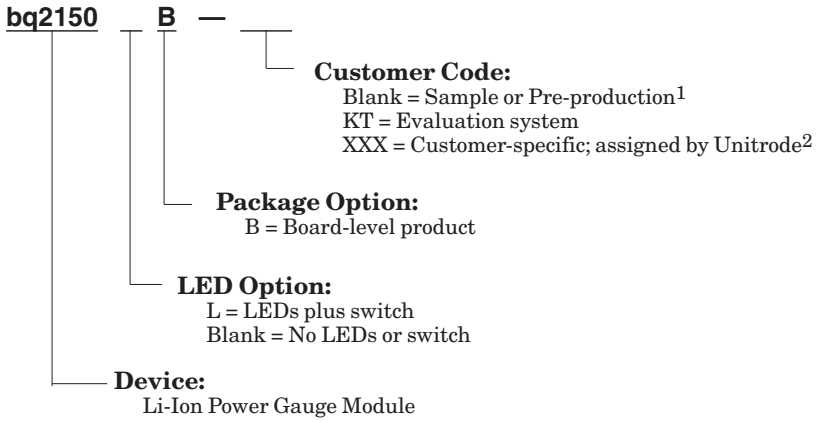
Notes: 1. At SB input of bq2050
2. At SR input of bq2050.
3. Default value; value set in DMF register.

Data Sheet Revision History

Change No.	Page No.	Description
1	2	Updated Table 1 to include 3.0A limit
1	5	Added 3.0A maximum continuous charge/discharge current specification

Note: Change 1 = May 1999 B changes from April 1999.

Ordering Information



Notes: 1. Requires configuration sheet (Table 1)

2. Example production part number: bq2150LB-001

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