

NiCd or NiMH Gas Gauge Module with Charge-Control Output

Features

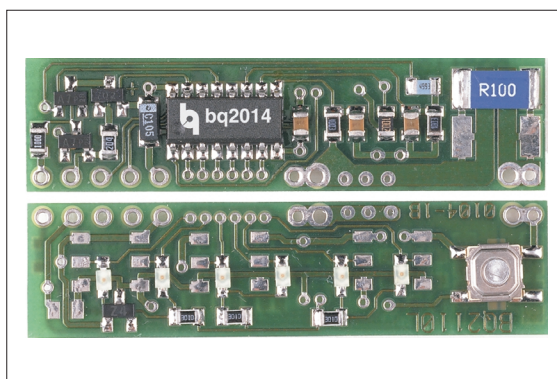
- Complete bq2014 Gas Gauge solution for NiCd or NiMH battery packs
- Charge-control output allows communication to external charge controller (bq2004)
- Battery information available over a single-wire bidirectional serial port
- Battery state-of-charge monitoring for 4- to 12-cell series applications
- On-board regulator allows direct connection to the battery
- “L” version includes push-button activated LEDs to display state-of-charge information
- Nominal capacity and cell chemistry pre-configured
- Compact size for battery pack integration

General Description

The bq2114 Gas Gauge Module provides a complete and compact solution for capacity monitoring of NiCd and NiMH battery packs. Designed for battery pack integration, the bq2114 incorporates a bq2014 Gas Gauge IC, a current sense resistor, and all other components necessary to accurately monitor and display the capacity of 4 to 12 series cells. The bq2114L includes five surface-mounted LEDs to display remaining capacity in 20% increments of the learned capacity (relative mode). The LEDs are activated with the onboard push-button switch.

Contacts are provided on the bq2114 for direct connection to the battery stack (BAT+, BAT-), the serial communications port (DQ), the empty indicator (EMPTY), and the charge control output (CHG). Please refer to the bq2014 data sheet for the specifics on the operation of the Gas Gauge.

Unitrode configures the bq2114 based on the information requested in Table 1. The configuration defines the number of series cells, the nominal battery pack capacity, and the self-discharge rate.



A module development kit is also available for the bq2114. The bq2114B-KT or bq2114LB-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 with the bq2114 to display charge/discharge activity and to allow user interface to the bq2014 from any standard DOS PC.
- 3) Source code for the TSR.

Pin Descriptions

P1	DQ/Serial communication port
P2	BAT+/Battery positive/pack positive
P3	CHG/Charge control output
P4	EMPTY/Empty indicator output
P5	GND/Ground
P6	PACK-/Pack negative
P7	BAT-/Battery negative

bq2114

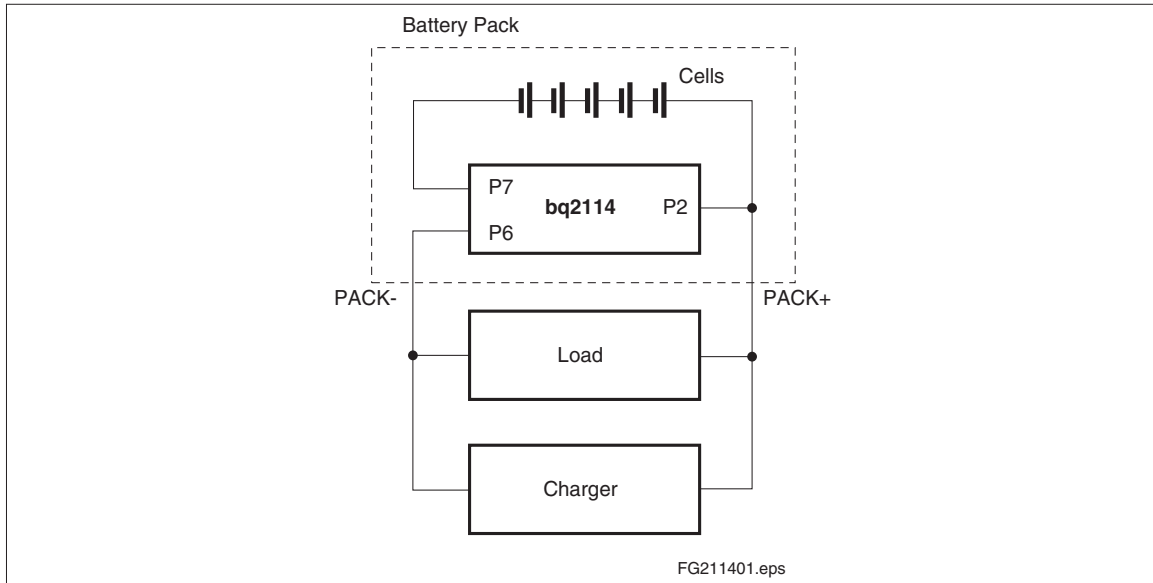


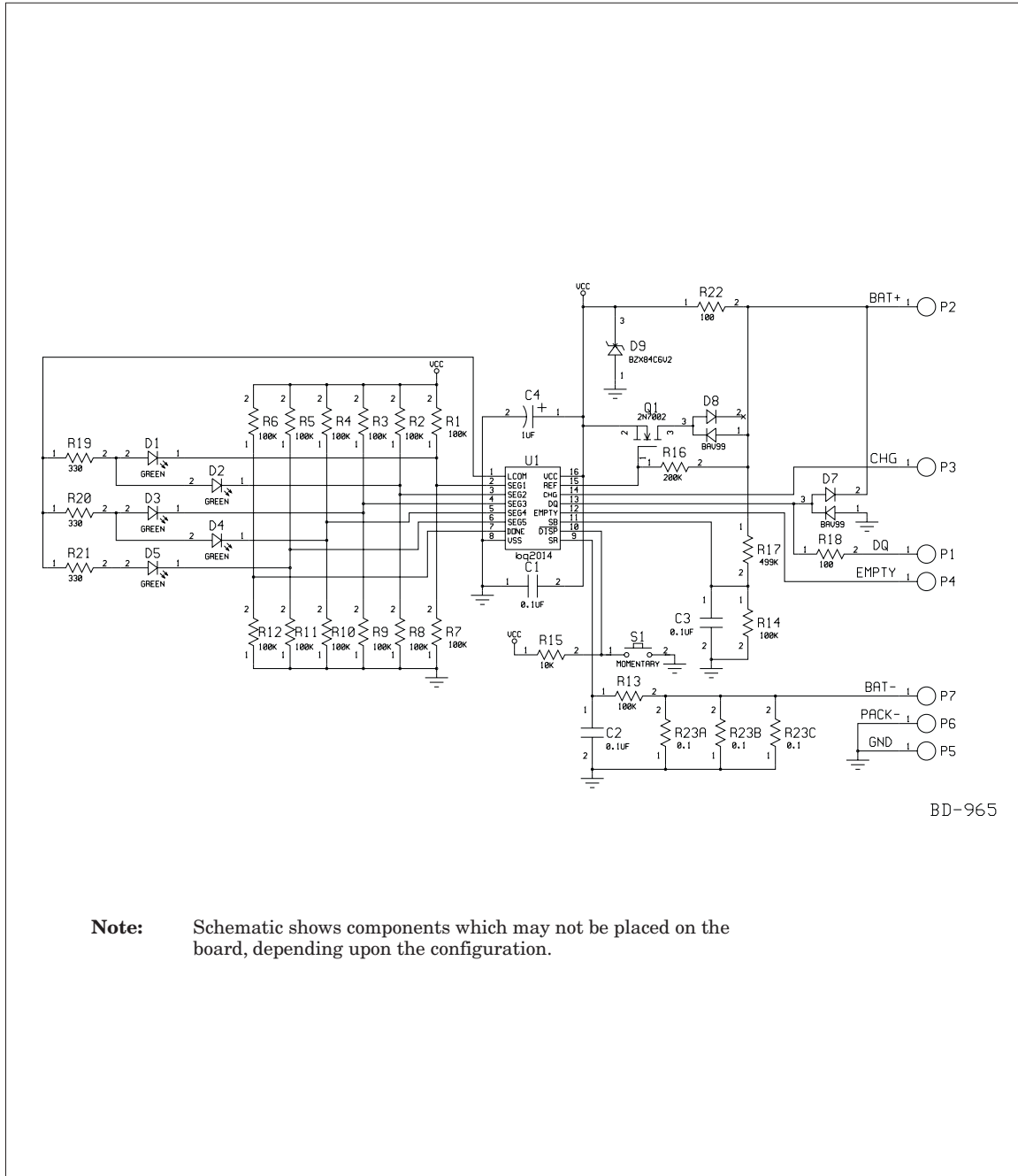
Figure 1. Module Connection Diagram

Table 1. bq2114 Module Configuration

Customer Name: _____			
Contact: _____		Phone: _____	
Address: _____			

Sales Contact: _____		Phone: _____	
Number of series battery cells (4–12)		_____	
Battery type (NiCd or NiMH)		_____	
Battery pack capacity (mAh)		_____	
Discharge rate into load (3.0A max.)		Min. _____	Avg. _____ Max. _____
Charge rate (3.0A max.)		_____	
LEDs and switch (Y/N)		_____	
FAE approval: _____		Date: _____	

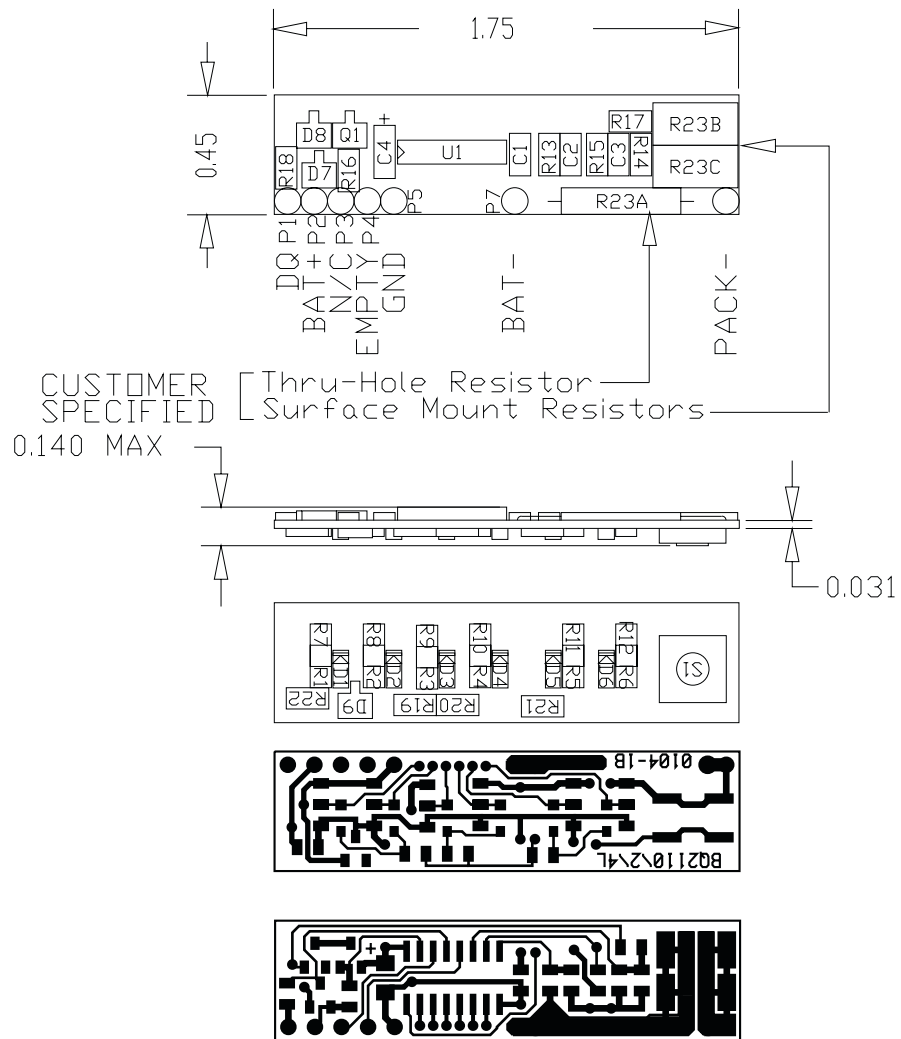
bq2114 Schematic



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

bq2114

bq2114 Board



Absolute Maximum Ratings

Symbol	Parameter	Minimum	Maximum	Unit	Conditions
V _{CC}	Relative to V _{SS}	-0.3	+7.0	V	bq2014
All other pins	Relative to V _{SS}	-0.3	+7.0	V	bq2014
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	4	-	12	-	
BAT+	Positive terminal of pack	GND	NumCell * 1.2V	NumCell * 1.8V	V	
BAT-	Negative terminal of pack	GND - 0.3	-	GND+2.0	V	
I _{CC}	Supply current at BAT+ terminal (no external loads)	-	200	300	μA	
R _{DQ}	Internal pull-down	500k	-	-	Ω ¹	
I _{OL}	Open-drain sink current DQ, EMPTY, CHG	-	-	5.0	mA ¹	
V _{OL}	Open-drain output low, DQ, EMPTY, CHG	-	-	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.

bq2114

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

Symbol	Parameter	Minimum	Typical	Maximum	Unit	Notes
VEDVF	Final empty warning	0.93	0.95	0.97	V	BAT+/NumCell ¹
VEDV1	First empty warning	1.03	1.05	1.07	V	BAT+/NumCell ¹
V _{MCV}	Maximum single-cell voltage	2.20	2.25	2.30	V	BAT+/NumCell ¹
V _{SRO}	Sense resistor range	-300	-	+2000	mV	V _{SR} + V _{OS} ²
V _{SRQ}	Valid charge	375	-	-	μV	V _{SR} + V _{OS} ^{2, 3}
V _{SRD}	Valid discharge	-	-	-300	μV	V _{SR} + V _{OS} ^{2, 3}

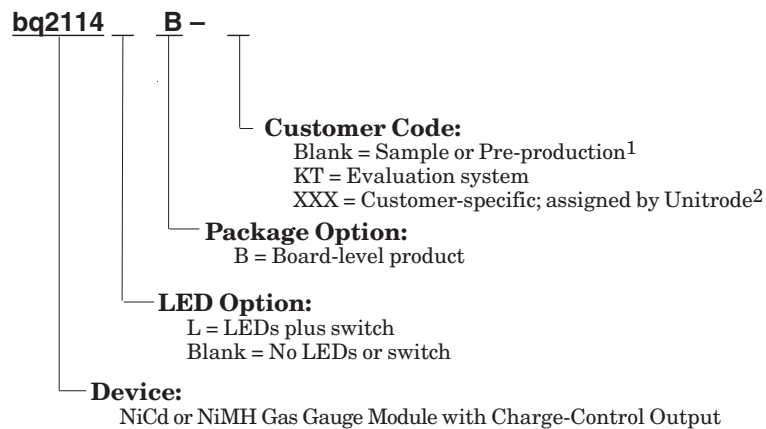
- Notes:**
1. At SB input of bq2014.
 2. At SR input of bq2014.
 3. Default value; value set in DMF register.

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 Sept. 1996.

Ordering Information



- Notes:**
1. Requires configuration sheet (see Table 1)
 2. Example production part number: bq2114LB-003

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