UNITRODE

Preliminary **bq2145**

Smart Battery Module with LEDs

Features

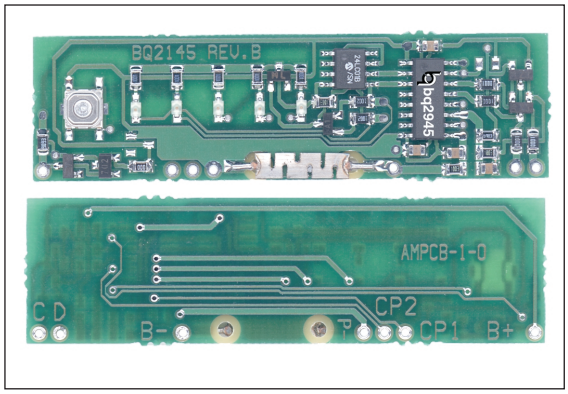
- Complete smart battery solution for NiCd, NiMH, and Li-Ion battery packs
- Based on the bq2945 Gas Gauge IC
- Accurate measurement of available battery capacity
- Designed for battery pack integration:
  - Measures only 2.5 (L) x 0.7 (W) inches
  - Includes Gas Gauge IC, configuration EEPROM, and sense resistor
  - Five onboard state-of-charge LEDs with push-button activation
  - Low operating current for minimal battery drain
- Critical battery information available over two-wire serial port

General Description

The bq2145 Smart Battery Module provides a complete solution for the design of intelligent battery packs. The bq2145 uses the SMBus protocol and supports Smart Battery Data commands in the SMB/SBD specifications. Designed for battery pack integration, the bq2145 combines the bq2945 Gas Gauge IC with a serial EEPROM on a small printed circuit board. The board includes all the necessary components to accurately monitor battery capacity and communicate critical battery parameters to the host system or battery charger. The bq2145 also includes five LEDs. The push-button switch activates the LEDs to show remaining battery capacity in 20% increments.

Contacts are provided on the bq2145 for direct connection to the battery stack (B+, B-) and the two-wire interface (C, D). Please refer to the bq2945 data sheet for specific information on the operation of the Gas Gauge and communication interface.

Unitrode configures the bq2145 based on the information requested in Table 1. The configuration defines the pack voltage, capacity, and chemistry and charge control parameters. The Smart Battery Module uses the onboard sense resistor to track charge and discharge activity of the battery pack. Figure 1 shows how the module connects to the cells.



A module development kit is also available for the bq2145. The bq2145B-KT or the bq2145LB-KT includes one configured module and the following:

1) An EV2200-45 interface board that allows connection to the serial port of any AT-compatible computer.

2) Menu-driven software to display charge/discharge activity and to allow user interface to the Gas Gauge IC and serial E^2PROM from any standard Windows 95 or 3.1x PC.

Pin Descriptions

B+	**BAT+/Battery positive/Pack positive**
P-	**PACK-/Pack negative**
C	**SMBC/Communications clock**
D	**SMBD/Serial data**
B-	**BAT-/Battery negative**
CP2	**Control pin 2**
CP1	**Control pin 1**

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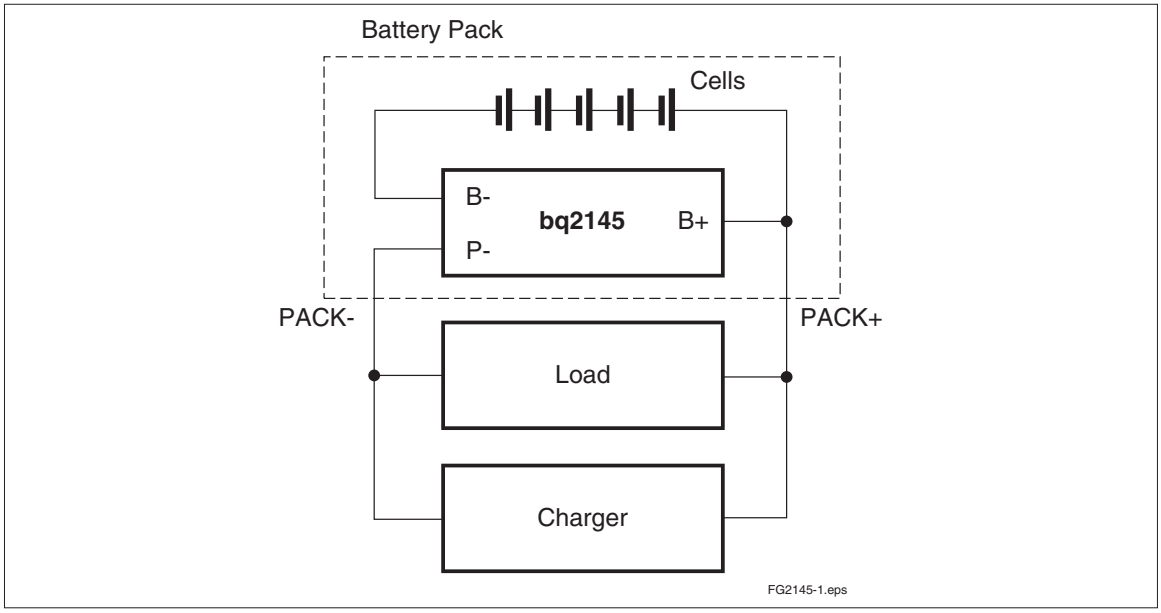


Figure 1. Module Connection Diagram

Table 1. bq2145 Module Configuration

Customer Name: _____

Contact: _____ Phone:_____

Address:_____

Sales Contact: _____ Phone: _____

Board Configuration

LEDs and switch	_____	Yes or No		
Display mode	_____	Relative or Absolute		
Discharge rate (3.0A max.)	Min _____	Avg _____	Max _____	
Duration at max. discharge	_____			
Number of series cells	_____			

EEPROM Configuration			Typical Values	
			NiMH	Li-Ion
Remaining time alarm (min)	_____	Sets the low time alarm level	10 min	10 min
Remaining capacity alarm (mAh)	_____	Sets the low capacity alarm level	C/10	C/10
Charging voltage (mV)	_____	Sets the requested charging voltage	65535	4.1V/cell
Design cpaacity (mAh)	_____	Defines the battery pack capacity	3000	3600
Design voltage (mV)	_____	Defines the battery pack voltage	12000	10800
Manufacturer date	_____	Battery pack manufacturer date	mm/dd/yy	mm/dd/yy
Serial number	_____	Battery pack serial number	0-65535	0-65535
Fast-charging current (mA)	_____	Sets the requested charging current	1C	1C
Maintenance charging current (mA)	_____	Sets the requested maintenance charging current	C/20	0
Li-Ion taper current (mA)	_____	Sets the upper limit for charge termination	NA	C/10
Maximum overcharge (mAh)	_____	Sets the maximum amount of overcharge	256mAh	128mAh
Maximum temperature (°C)	_____	Sets the maximum charge temperature	61°C	61°C
ΔT/Δt (°C/min)	_____	Sets the termination rate	3°C/3min	4.6°C/20s
Fast-charge efficiency (%)	_____	Sets the fast-charge efficiency factor	95%	100%
Maintenance charge efficiency (%)	_____	Sets the maintence charge efficiency factor	80%	100%
Self-discharge rate (%/day)	_____	Sets the batterys self-discharge rate	1.5%/day	0.2%/day
EDV1 (mV)	_____	Sets the initial end-of-discharge warning	1.05V/cell	3.0V/cell
EDVF (mV)	_____	Sets the final end-of-discharge warning	1.0V/cell	2.8V/cell
Hold-off timer for ΔT/Δt (sec.)	_____	Sets the hold off period for ΔT/Δt termination	180s	320s
Manufacturer name	_____	Programs manufacturer's name (11 char. max)	bq	bq
Device name	_____	Programs device name (7 char. max)	bq36	bq202
Chemistry	_____	Programs pack's chemistry (7 char. max)	NiMH	LION
Manufacturer data	_____	Open field (5 char. max)	2040	2040
FAE Approval	_____		Date: _____	

bq2145 Schematic

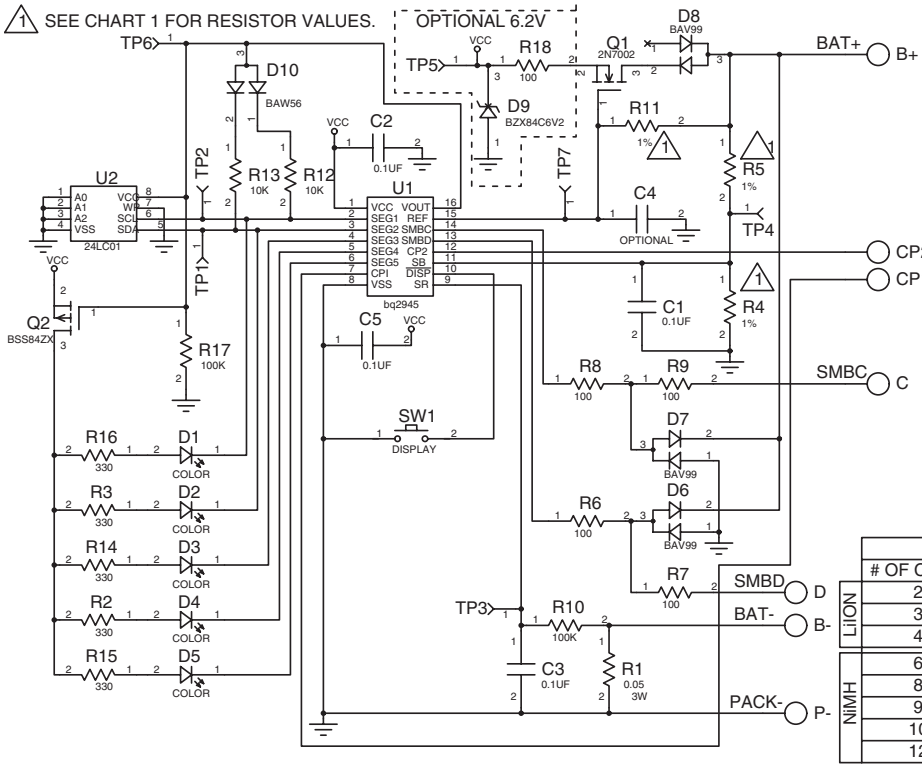
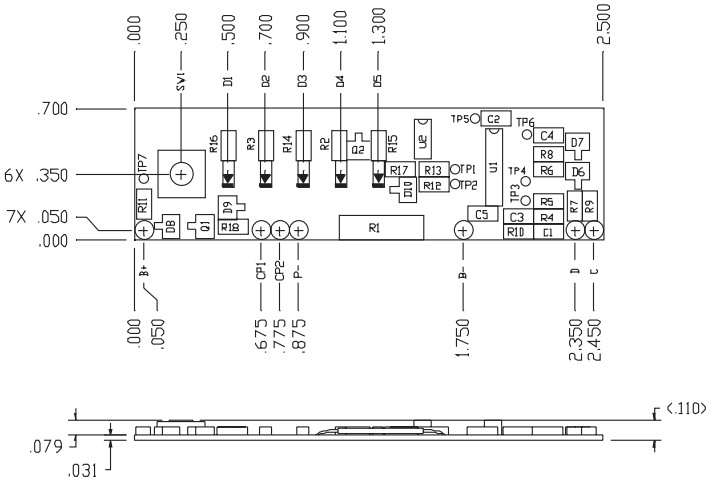
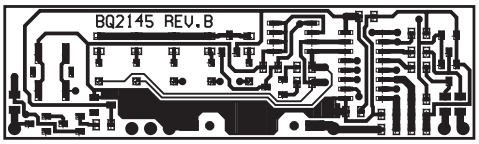


CHART 1

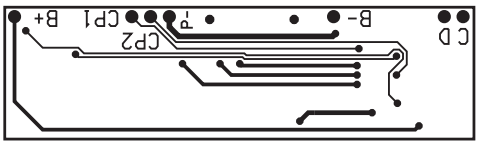
	# OF CELLS	R5	R11	R4
LiION	2	301K	86.5K	100K
	3	499K	909K	100K
	4	698K	909K	100K
NiMH	6	499K	162K	100K
	8	698K	402K	100K
	9	806K	604K	100K
	10	909K	909K	100K
	12	909K	1M	86.5K

bq2145 Board



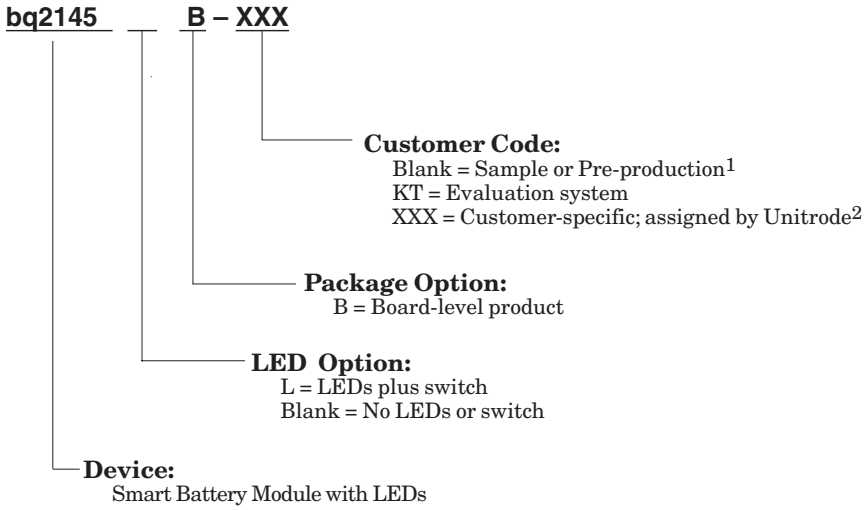


LAYER 1



LAYER 2

Ordering Information



Notes:
1. Requires configuration sheet (see Table 1)
2. Example production part number: bq2145LB-001

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