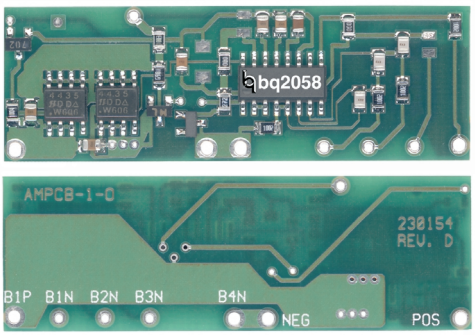
UNITRODE

bq2158

Three or Four Series Cell Li-Ion Pack Supervisor Module

Features

- Complete and compact lithium-ion pack supervisor
- Provides overvoltage, undervoltage, and overcurrent protection for three or four series Li-Ion cells
- Combines bq2058 with charge/discharge control FETs
- High side low on-resistance FETs
- Designed for battery pack integration
  - Direct connection for series battery terminals
  - Measures 2.10 X 0.70 inches
- Low standby and operating currents



General Description

The bq2158 provides a complete solution for the supervision of three or four series Li-Ion cells. Designed for battery pack integration, the bq2158 incorporates a bq2058 Pack Supervisor, two FETs, and all other components required to monitor overvoltage, undervoltage, and overcurrent conditions. The board provides direct connections for the negative and positive terminals of each cell. See Figure 1. Please refer to the bq2058 data sheet for specific information on the operation of the bq2058.

Unitrode configures the bq2158 based on the information in Table 1.

Pin Descriptions

B1P	**Battery 1 positive input/pack positive**
B1N	**Battery 1 negative input**
B2N	**Battery 2 negative input**
B3N	**Battery 3 negative input**
B4N	**Battery 4 negative input**
POS	**Pack positive**
NEG	**Pack negative**

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Table 1. bq2158 Module Configuration

Customer Name: _____

Contact: _____ Phone: _____

Address: _____

_____

Sales Contact: _____ Phone: _____

Number of series cells (3 or 4) _____

Overvoltage threshold (4.25, 4.30 or 4.35V) _____

Charge current (3.9A max.) _____

Discharge current (3.9A max.) _____

FAE approval: _____ Date: _____

Table 2. Pin Connections

Number of Cells	On-board bq2058 Configuration
3 cells	BAT1N tied to BAT1P NSEL = V_{SS}
4 cells	NSEL = V_{CC}

Operation

The bq2158 monitors each series element for under-voltage, over-voltage, and over-current conditions. If a cell falls below V_{UV} for t_{UVD}, the bq2158 enters into sleep mode. The bq2158 wakes up and enables discharge if a voltage, V_{CD} higher than the battery voltage, is applied across POS and NEG. Charging is disabled if a cell exceeds V_{OV} for t_{OVD}, and can resume when the cell falls below the V_{CE} threshold. The bq2158 turns the discharge FET off if the steady state load current exceeds I_{OC} for t_{OCD} and turns it back on if the load is removed.

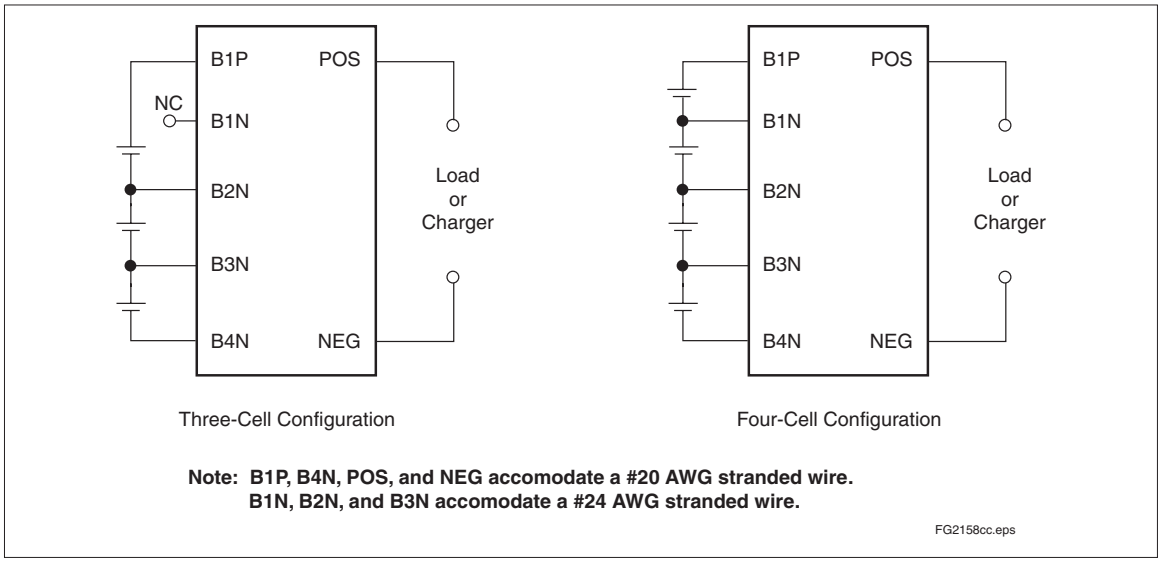
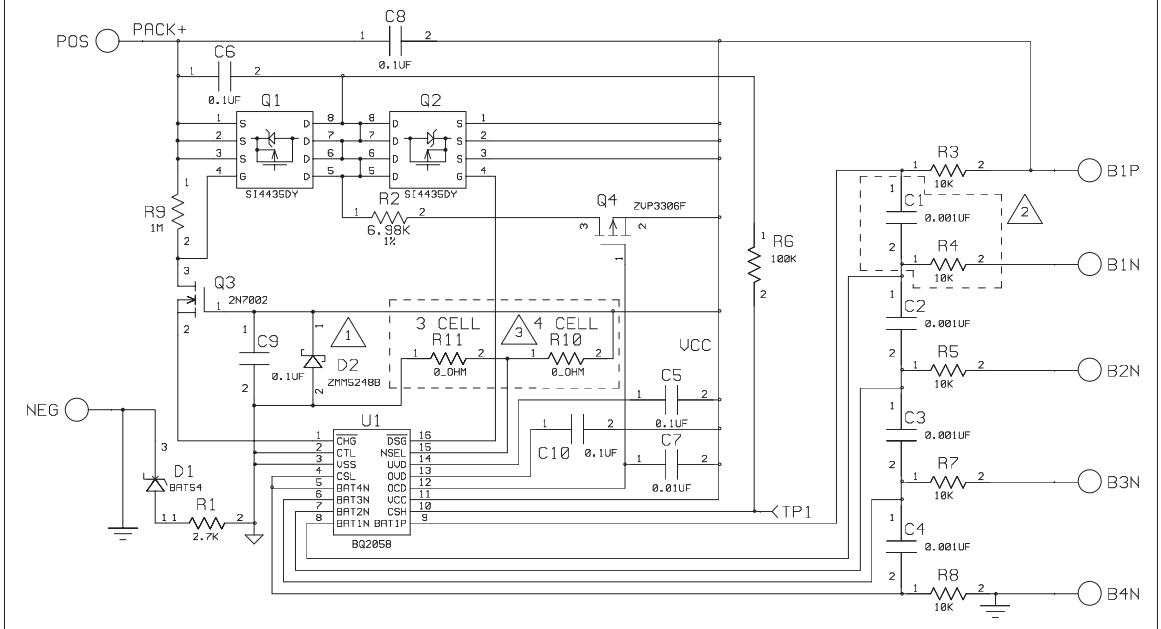


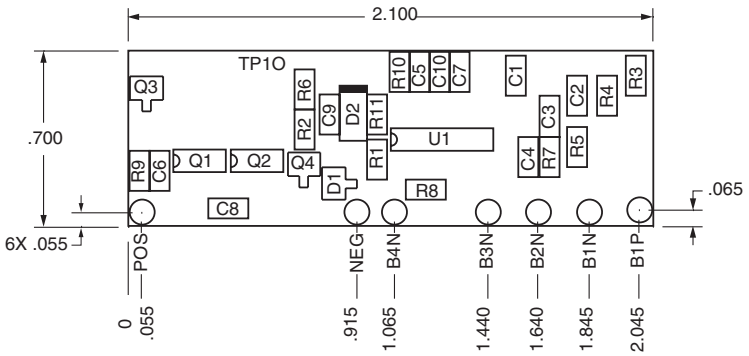
Figure 1. Module Connection Diagram

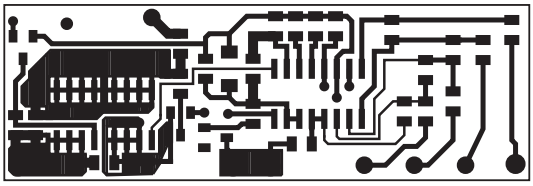
bq2158 Schematic



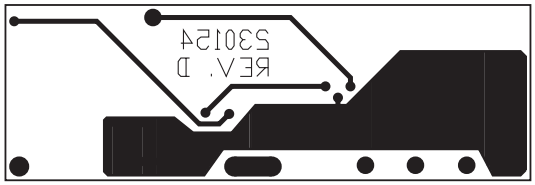
1. NOT USED.
2. FOR 3-CELL APPLICATION REMOVE R4 AND INSTALL 0 OHM RESISTOR IN C1 LOCATION.
3. FOR 3-CELL APPLICATION OMIT R10, FOR 4-CELL APPLICATION OMIT R11.

bq2158 Board





LAYER 1



LAYER 2

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit	Conditions
V_{OP}	Supply voltage (B1P to B4N)	18	V	DC
V_{TR}	Maximum transient voltage (B1P to B4N)	32	V	Maximum duration = 1.5µs
V_{CHG}	Charging voltage (POS to NEG)	18	V	
I_{CHG}	Continuous charge/discharge current	3.9	A	V_{OP} > 6V T_A = 25°C
T_{OPR}	Operating temperature	-30 to +70	°C	
T_{STG}	Storage temperature	-55 to +125	°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
V_{OP}	Operating voltage, B1P to B4N	4.0	-	18	V	
I_{CCA}	Operating current	-	39	57	µA	
I_{CCS}	Sleep current	-	0.7	1.5	µA	No load across POS and NEG
R_{ON}	On resistance, B1P to POS	-	-	50	mΩ	T_A = 25°C V_{OP} = 10V

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

Symbol	Parameter	Value	Tolerance	Unit	Notes
V_{OV}	Overvoltage threshold	4.25	± 50mV	V	
V_{CE}	Charge enable voltage	V_{OV} - 100mV	± 50mV	V	
V_{UV}	Undervoltage limit	2.25	± 100mV	V	
I_{OC}	Overcurrent limit	3.4		A	T_A = 25°C
		3.8		A	T_A = 60°C
t_{UVD}	Undervoltage delay	950	±50%	ms	T_A = 30°C
V_{CD}	Charge detect threshold	70	-60, +80	mV	
t_{OVD}	Overvoltage delay	950	±50%	ms	T_A = 30°C
t_{OCD}	Overcurrent delay	12	±60%	ms	T_A = 30°C

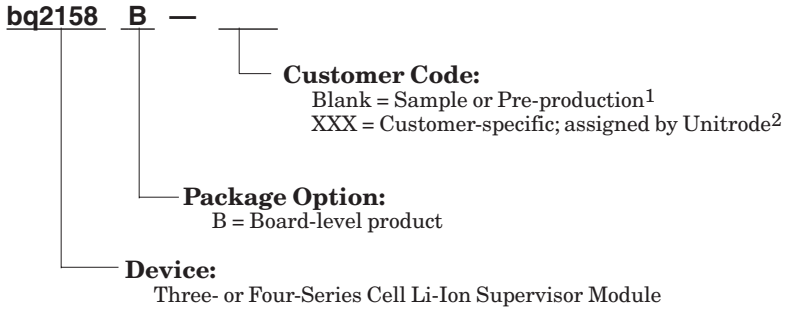
Note: The thresholds above reflect the operation of a bq2158 using the standard bq2058 IC (V_{OV} = 4.25V). Specify other versions of the bq2058 by indicating the appropriate V_{OV} threshold in Table 1.

Data Sheet Revision History

Change No.	Page No.	Description	Nature of Change
1	3	Table 2 pin connections	Clarified onboard bq2058 connection.

Note: Change 1 = May 1999 B changes from July 1996.

Ordering Information



Notes:
1. Requires configuration sheet (Table 1)
2. Example production part number: bq2158B-001

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