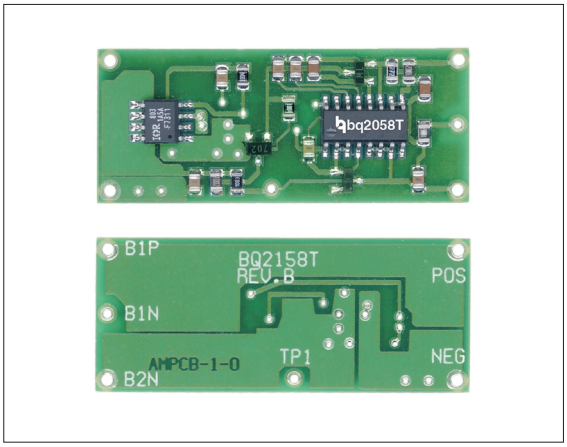
UNITRODE

Preliminary **bq2158T**

# Two Series Cell Li-Ion Pack Supervisor Module

## Features

- Complete and compact lithium-ion pack supervisor
- Provides overvoltage, undervoltage, and overcurrent protection for two series Li-Ion cells
- Combines bq2058T with charge/discharge control FETs
- Low side low on-resistance FETs
- Designed for battery pack integration
  - Direct connection for series battery terminals
  - Measures 1.70 X 0.70 inches
- Low standby and operating currents




## General Description

The bq2158T provides a complete solution for the supervision of two series Li-Ion cells. Designed for battery pack integration, the bq2158T incorporates a bq2058T 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 bq2058T data sheet for specific information on the operation of the bq2058T.

Unitrode configures the bq2158T based on the information in Table 1.

## Pin Descriptions

| | |
|---|---|
| **B1P** | **Battery 1 positive input** |
| **B1N** | **Battery 1 negative input** |
| **B2N** | **Battery 2 negative input** |
| **POS** | **Pack positive** |
| **NEG** | **Pack negative** |

**Table 1. bq2158T Module Configuration**

Customer Name: _____

Contact: _____ Phone: _____

Address: _____

_____

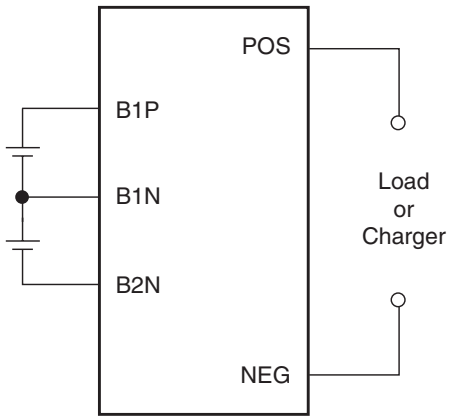
Sales Contact: _____ Phone: _____

Overvoltage threshold (4.25V) _____

Charge current (3.8A max.) _____

Discharge current (3.8A max.) _____

FAE approval: _____ Date:_____




**Note: B1P, B2N, POS, and NEG accomodate a #20 AWG stranded wire.**
**B1N accomodates a #24 AWG stranded wire.**

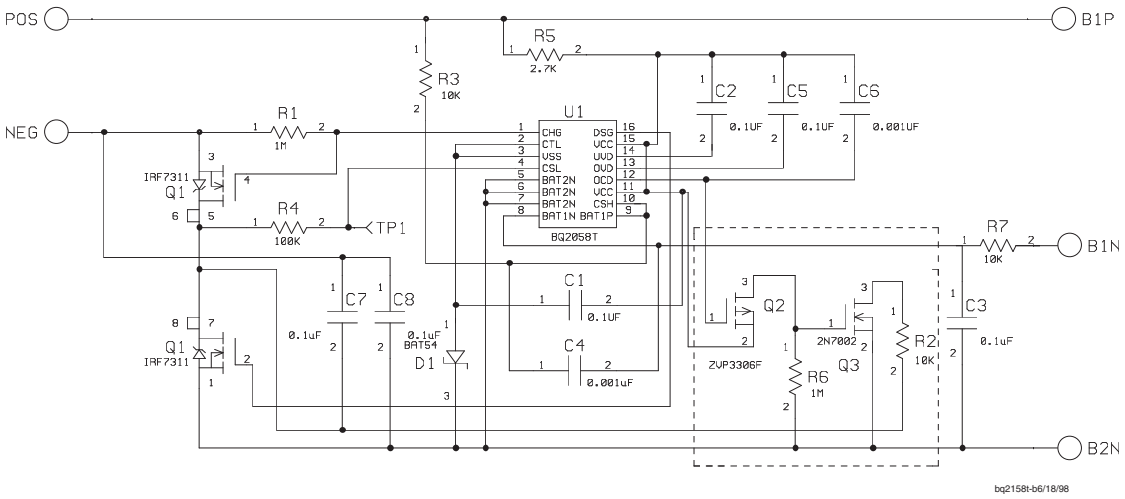
FG2158Tcd.eps

**Figure 1. Module Connection Diagram**

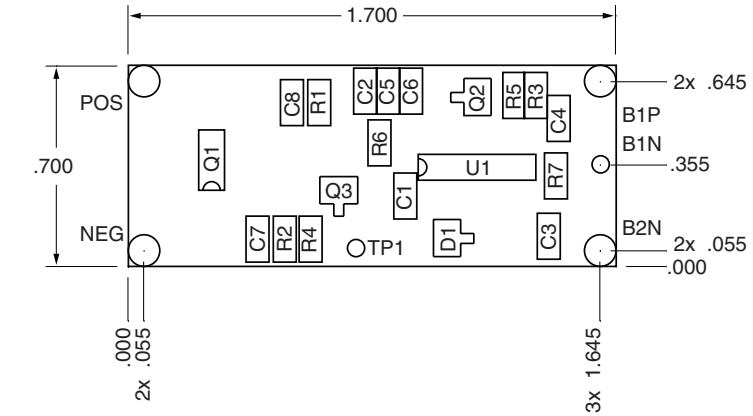
## Operation

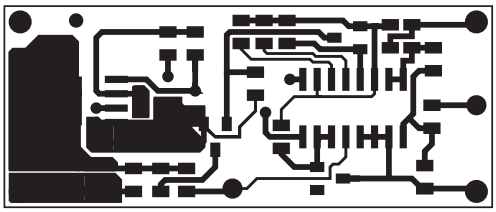
The bq2158T monitors each series element for under-voltage, over-voltage, and over-current conditions. If a cell falls below $V_{UV}$ for $t_{UVD}$, the bq2158T enters into sleep mode. The bq2158T wakes up and enables discharge if a voltage, $V_{CD}$ higher than the battery voltage, is applied across 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 bq2158T 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.

## bq2158T Schematic

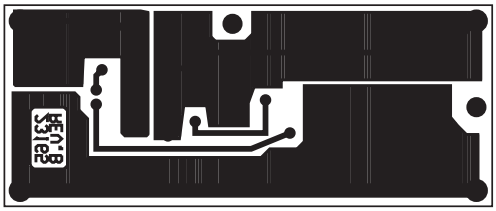


## bq2158T Board



LAYER 1



LAYER 2

## Absolute Maximum Ratings

| Symbol | Parameter | Value | Unit | Conditions |
|---|---|---|---|---|
| $V_{OP}$ | Supply voltage (B1P to B2N) | 12 | V | DC |
| $V_{TR}$ | Maximum transient voltage (B1P to B2N) | 32 | V | Maximum duration = 1.5µs |
| $V_{CHG}$ | Charging voltage (POS to NEG) | 12 | V | |
| $I_{CHG}$ | Continuous charge/discharge current | 3.8 | A | $V_{OP}$ > 4V<br>$T_A$ = 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 B2N | 4.0 | - | 12 | V | |
| $I_{CCA}$ | Operating current | - | 26 | 43 | µA | |
| $I_{CCS}$ | Sleep current | - | 0.7 | 1.5 | µA | No load across POS and NEG |
| $R_{ON}$ | On resistance, B2N to NEG | - | - | 100 | mΩ | $T_A$ = 25°C<br>$V_{OP}$ = 4.5V |

## 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 | 3.3 | | A | $T_A$ = 25°C |
| | | 3 | | 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 |

## Ordering Information

**bq2158T B —**

**Customer Code:**
Blank = Sample or Pre-production[1]
XXX = Customer-specific; assigned by Unitrode[2]

**Package Option:**
B = Board-level product

**Device:**
Two-Series Cell Li-Ion Supervisor Module

**Notes:**
1. Requires configuration sheet (Table 1)
2. Example production part number: bq2158TB-001

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