

## Li-Ion Charger Development System Control of On-Board PNP Switch-Mode Regulator

### Features

- bq2054 fast-charge control evaluation and development, based on switching buck converter with low-side battery-current sensing
- On-board configuration for fast charge of 1, 2, 3, or 4 Li-Ion cells
- Charge termination by selectable minimum current, or maximum time-out
- Constant current (up to 1.25A) and constant voltage (up to 16.8V) provided by on-board switch-mode regulator
- Jumper-configurable LED display
- Direct connections for battery and thermistor
- Maximum charge time of 5 hours

### General Description

The DV2054S2 Development System provides a development environment for the bq2054 Lithium Ion Fast-Charge IC. The DV2054S2 incorporates a bq2054 and a buck-type switch-mode regulator to provide fast charge control for 1 through 4 Li-Ion cells.

Fast charge is preceded by a pre-charge qualification period.

Fast charge termination occurs on:

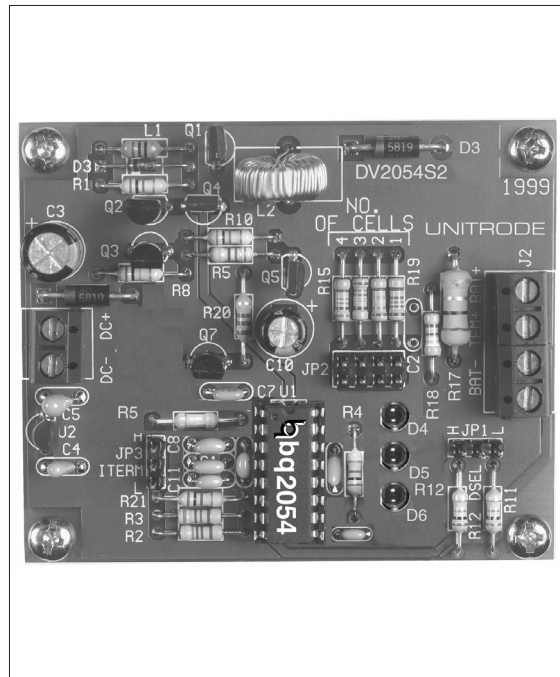
Minimum current –  $I_{MAX}$  divided by 10, 20, or 30

Maximum time-out

The bq2054 can be reset and a new charge cycle started by application of power to the board or battery replacement.

The user provides a DC power supply and batteries and configures the board for the number of cells, the minimum current threshold, and the LED display mode. The board has direct connections for the battery and the provided thermistor.

Before using the DV2054S2 board, please review the bq2054 data sheet.



### Connection Descriptions

|      |                                                      |
|------|------------------------------------------------------|
| J1   |                                                      |
| DC+  | Charger supply positive (24VDC max.)                 |
| DC-  | Charger supply ground                                |
| J2   |                                                      |
| BAT+ | Positive battery terminal                            |
| TEM+ | Positive thermistor connections                      |
| BAT- | Negative battery terminal and thermistor connection. |
| JP1  | Display mode selection                               |
| JP2  | Number of cells selection                            |
| JP3  | Full and minimum current termination select          |

## DV2054S2

### Fixed Configuration

The DV2054S2 board has the following characteristics:

V<sub>CC</sub> for the fast-charge IC is regulated onboard from the supply at connector J1.

J1 can accept a maximum of 25VDC.

LED indicates charge status.

Charge begins on the later application of

- The battery
- Supply voltage

The on-board regulator supplies a fast charge current I<sub>MAX</sub> of 1.25A. The fast-charge voltage V<sub>MAX</sub> is set at 25°C.

The switching frequency of the PWM control loops is 120kHz.

The regulated current is controlled by the value of the sense resistor R<sub>SNS</sub> according to the relationship

$$I_{CHG} = \frac{0.250V}{R_{SNS}}$$

The value of R<sub>SNS</sub> (R17 in the schematic) at shipment is 0.200Ω. This resistor can be changed depending on the application. The maximum charging current I<sub>MAX</sub> for the DV2054S2 board is 1.25A.

The thermistor provided is a Philips 2322–640–63103. With this thermistor connected between TEM+ and BAT-, the temperature fault limits are V<sub>LTF</sub> (low-temperature fault) = 0°C, V<sub>HTF</sub> (high-temperature fault) = 45°C, and V<sub>TCO</sub> (charge cutoff) = 47°C.

### Jumper-Selectable Configuration

The DV2054S2 can be configured as follows (see Jumper Configuration Diagram for location of the jumpers):

**JP1:** Configures the display mode (DSEL).

| JP1     | Display Mode |
|---------|--------------|
| [1 2] 3 | Mode 1       |
| 1 [2 3] | Mode 2       |
| 1 2 3   | Mode 3       |

**JP2:** Configures the board for the number of cells.

| JP2               | Number of Cells |
|-------------------|-----------------|
| [1 2] 3 4 5 6 7 8 | 1               |
| 1 2 [3 4] 5 6 7 8 | 2               |
| 1 2 3 4 [5 6] 7 8 | 3               |
| 1 2 3 4 5 6 [7 8] | 4               |

**JP3:** Sets the minimum current termination.

| JP3     | I <sub>MIN</sub>     |
|---------|----------------------|
| [1 2] 3 | I <sub>MAX</sub> /10 |
| 1 [2 3] | I <sub>MAX</sub> /20 |
| 1 2 3   | I <sub>MAX</sub> /30 |

### Setup Procedure

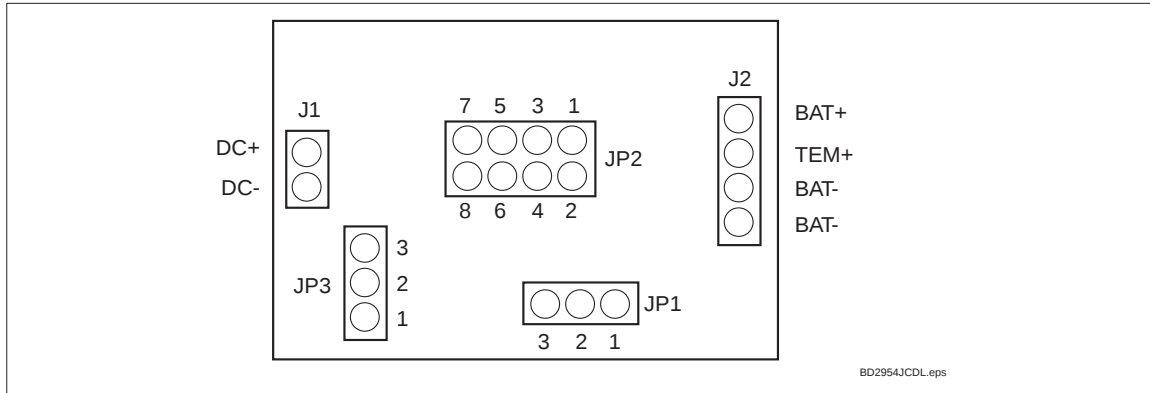
1. Connect the thermistor to TEM+ and BAT-.
2. Attach the battery pack to BAT+ and BAT-.
3. Connect the charging supply to J1.

The following table shows the minimum input requirement for a given number of cells.

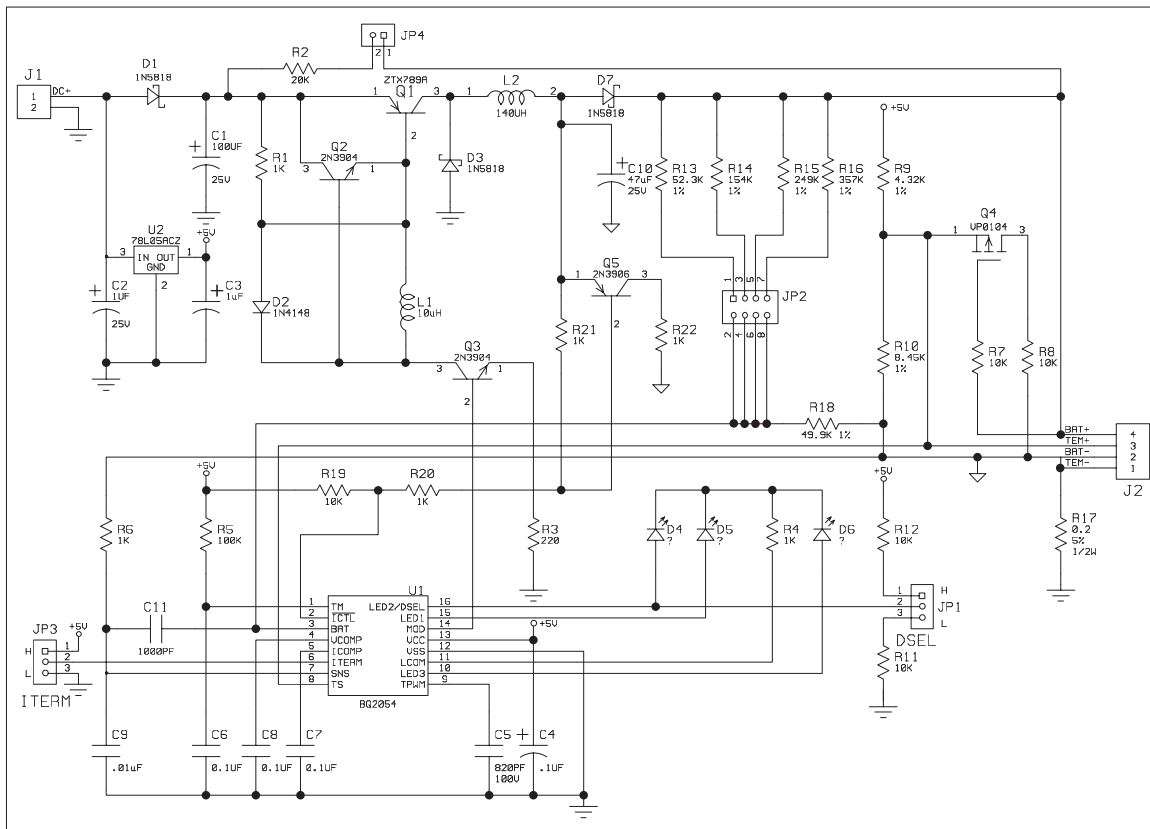
| Number of Cells | Minimum Charger Supply Input |
|-----------------|------------------------------|
| 1               | 8.5VDC                       |
| 2               | 13VDC                        |
| 3               | 19VDC                        |
| 4               | 25VDC                        |

The combined charging and system load should not exceed the I<sub>MAX</sub> limit of 1.25A.

## Jumper Configuration Diagram



## DV2054S2 Board Schematic



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