UNITRODE

DV2954S1L

Li-Ion Charger Development System

Control of On-Board PNP Switch-Mode Regulator with Low-Side Current Sensing

Features

- bq2954 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 maximum voltage, 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 bicolor-LED display
- Direct connections for battery and thermistor
- Maximum charge time of 5 hours

General Description

The DV2954S1L Development System provides a development environment for the bq2954 Lithium Ion Fast-Charge IC. The DV2954S1L incorporates a bq2954 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.

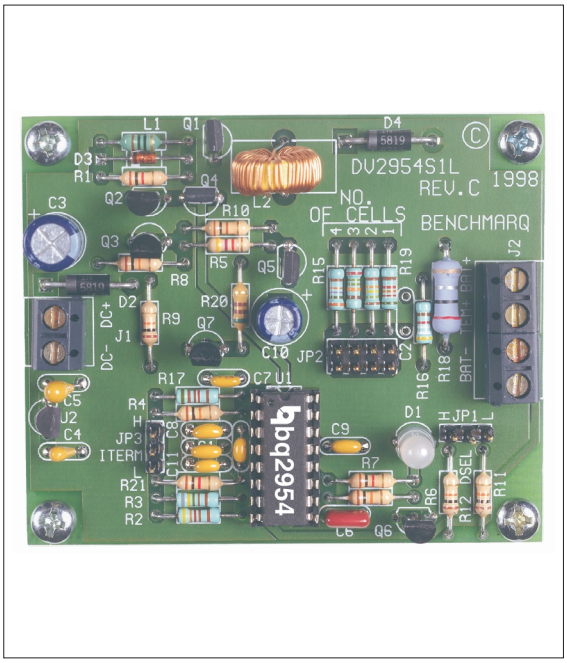
Fast charge termination occurs on:

- Minimum current – I_{MAX} divided by 10, 15, or 20
- Maximum time-out

The bq2954 can be reset and a new charge cycle started by applicaton of power to the board or battery replacement. The board automatically initiates a recharge when the battery voltage drops to 3.85V per cell.

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 DV2954S1L board, please review the bq2954 data sheet.



Connection Descriptions

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

Fixed Configuration

The DV2954S1L board has the following characteristics:

- V_{CC} for the fast-charge IC is regulated onboard from the supply at connector J1.
- J1 can accept a maximum of 24VDC.
- 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_{MAX} of 1.25A. The fast-charge voltage V_{MAX} 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_{SNS} according to the relationship

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

The value of R_{SNS} (R18 in the schematic) at shipment is 0.200Ω. This resistor can be changed depending on the application. The maximum charging current I_{MAX} for the DV2954S1L 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_{LTF} (low-temperature fault) = 0°C, V_{HTF} (high-temperature fault) = 45°C, and V_{TCO} (charge cutoff) = 47°C.

Jumper-Selectable Configuration

The DV2954S1L can be configured as follows (see Jumber Configuration Diagram for location of the jumbers):

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 full and minimum current termination.

JP3	I_{FULL}	I_{MIN}
[**1 2**] 3	$I_{MAX}/5$	$I_{MAX}/10$
1 [**2 3**]	$I_{MAX}/10$	$I_{MAX}/15$
1 2 3	$I_{MAX}/15$	$I_{MAX}/20$

Setup Procedure

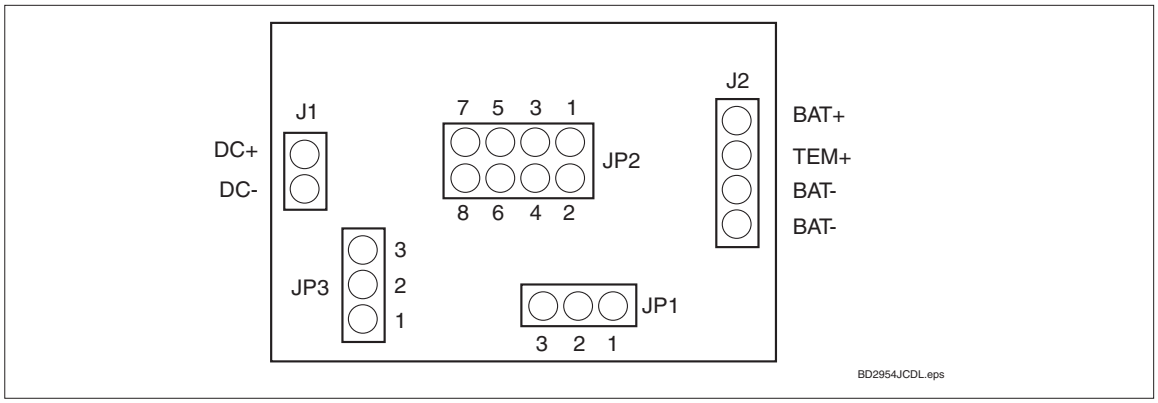
1. Connect the thermistor to TEM+ and BAT-.
2. Attach the battery pack to BAT+ and BAT-.
3. Connect the charging supply to J1.

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

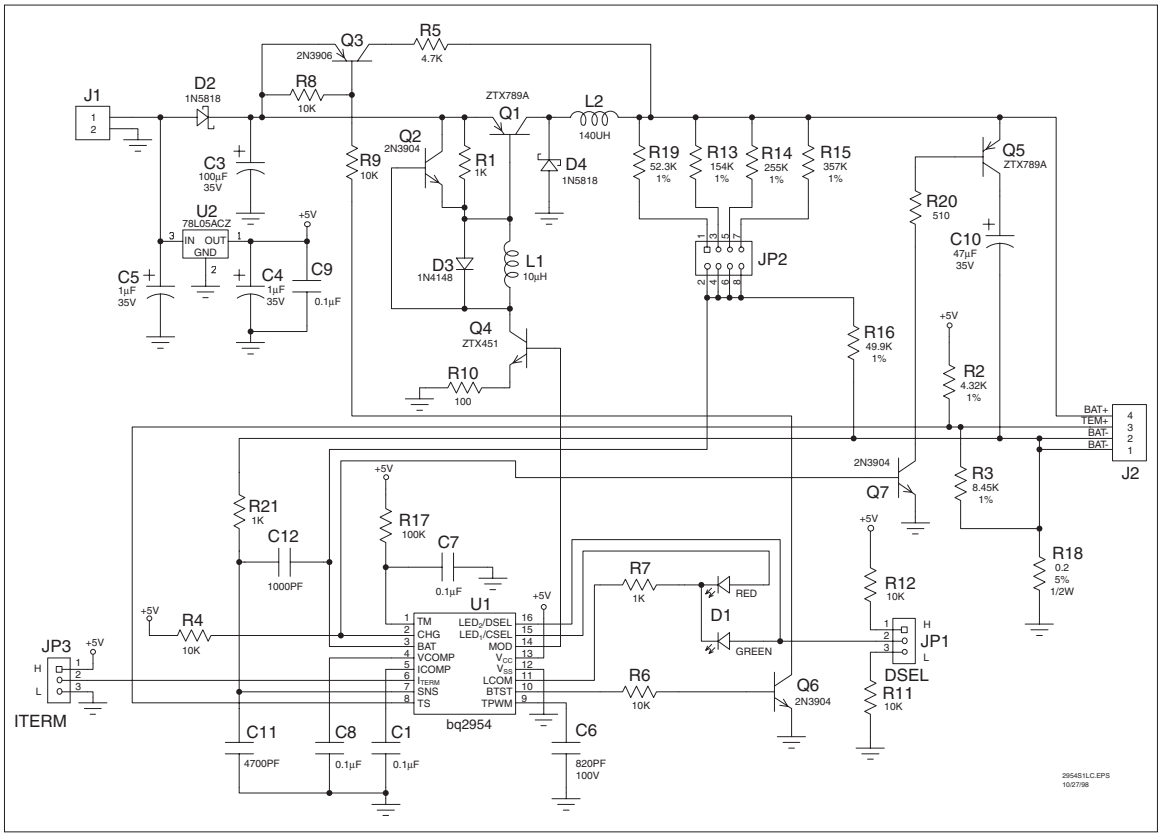
Number of Cells	Minimum Charger Supply Input
1	7.5VDC
2	12VDC
3	18VDC
4	23VDC

The combined charging and system load should not exceed the I_{MAX} limit of 1.25A.

Jumper Configuration Diagram



DV2954S1L Board Schematic



Rev. C Board

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