



UNITRODE

DV2954S1H

Li-Ion Charger Development System Control of On-Board PNP Switch-Mode Regulator with High-Side Current Sensing

Features

- ▶ bq2954 fast-charge control evaluation and development, based on switching buck converter with high-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 DV2954S1H Development System provides a development environment for the bq2954 Lithium Ion Fast-Charge IC. The DV2954S1H incorporates a bq2954 and a buck-type switch-mode regulator to provide fast-charge control for 1–4 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 application of power to the board or replacement of the battery. 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 DV2954S1H 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+ | Positive thermistor connections |
| | GND | Negative battery terminal and thermistor connecton. |
| JP1 | | Full current and minimum current termination-selection |
| JP2 | | Display mode selection |
| JP3 | | Number of cells selection |

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Fixed Configuration

The DV2954S1H 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} (R20 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 DV2954S1H board is 1.25A.

The thermistor provided is a Philips 2322–640–63103. With this thermistor connected between TEM+ and GND, 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 DV2954S1H can be configured as follows. (See Jumper Configuration Diagram for location of the jumpers.)

JP1: Sets the full and minimum current termination.

| JP1 | 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 | $I_{MAX}/15$ | $I_{MAX}/20$ |

JP2: Configures the display mode (DSEL).

| JP2 | Display Mode |
|---------|--------------|
| 1 [2 3] | Mode 1 |
| [1 2] 3 | Mode 2 |
| 1 2 3 | Mode 3 |

JP3: Configures the board for the number of cells.

| JP3 | 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 |

Setup Procedure

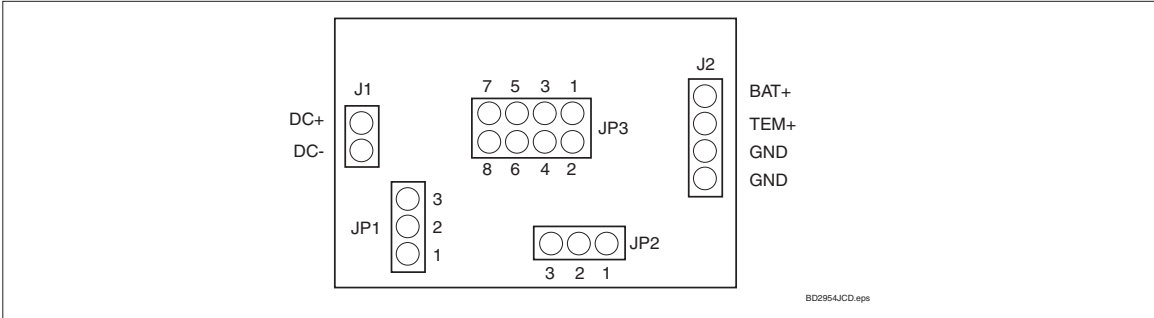
1. Configure DSEL, maximum time-out, and the number of cells.
2. Connect the thermistor to TEM+ and GND.
3. Attach the battery pack to BAT+ and GND.
4. Connect the charging supply to J1.

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

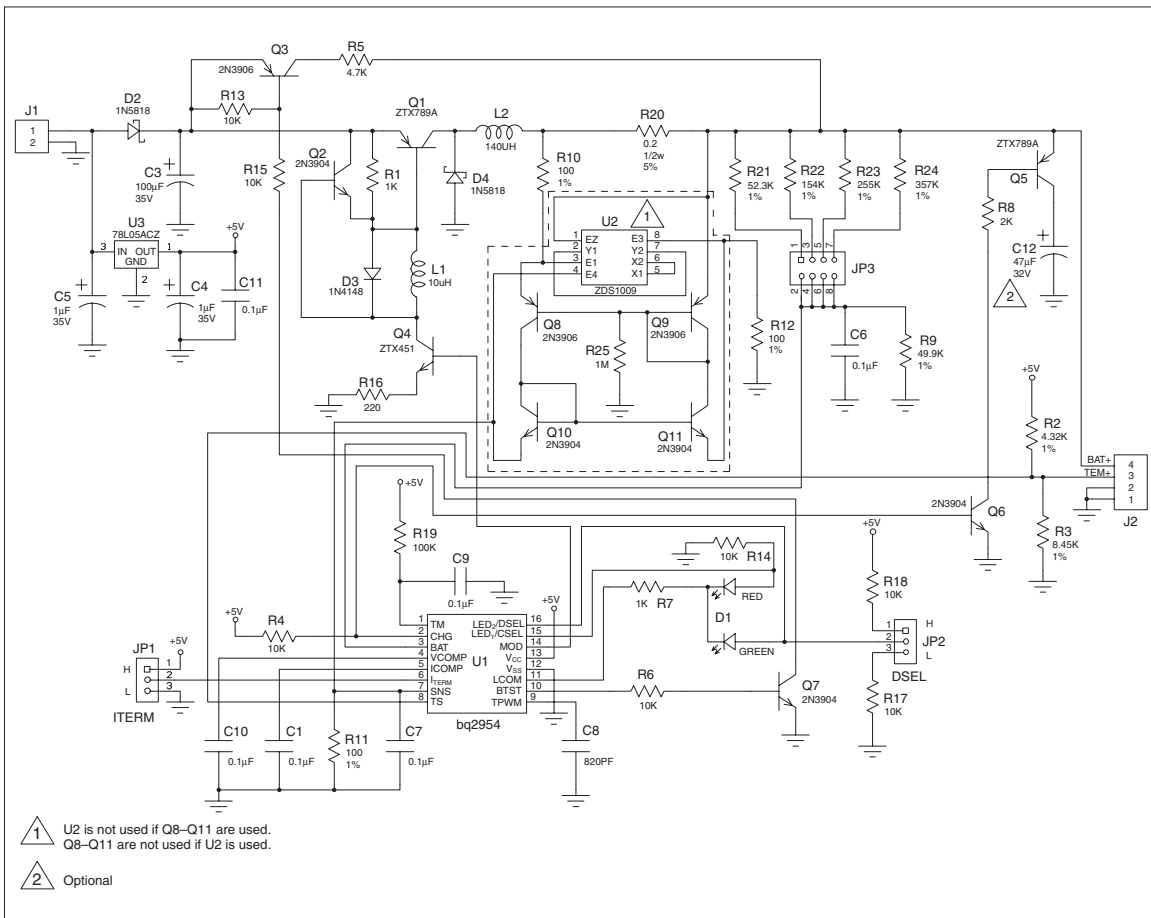
| Number of Cells | Minimum Charger Supply Input |
|-----------------|------------------------------|
| 1 | 7.5VDC |
| 2 | 12VDC |
| 3 | 18VDC |
| 4 | 23VDC |

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

Jumper Configuration Diagram



DV2954S1H Board Schematic



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