Application Report
SLUA662–November 2012

bq2945xy and bq2947xy Cascade Voltage Monitoring

Battery Management Solutions

ABSTRACT

This document details the required configuration for cascading multiple devices for monitoring OVP using the bq2945xy and bq2947xy families of devices.

Contents

1 Introduction

The bq2945xy and bq2947xy families of devices can be cascaded for monitoring OVP and triggering an output to achieve safety requirements.

The devices monitor each cell voltage individually, and after a fixed delay triggers the output once V_{OVP} is detected. This then activates an output signal (active high) to drive an external switch.

The cascaded devices are referenced such that the maximum voltage seen on the output is NOT greater than the specified parameter for Voh.

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2 Circuit Configurations

2.1 bq2945xy Circuit Configurations

The following circuit configuration is recommended for monitoring and triggering for OVP of multiple cells in series. Each cell is monitored independently.

NOTE: This circuit can be duplicated for multiple cells in series.

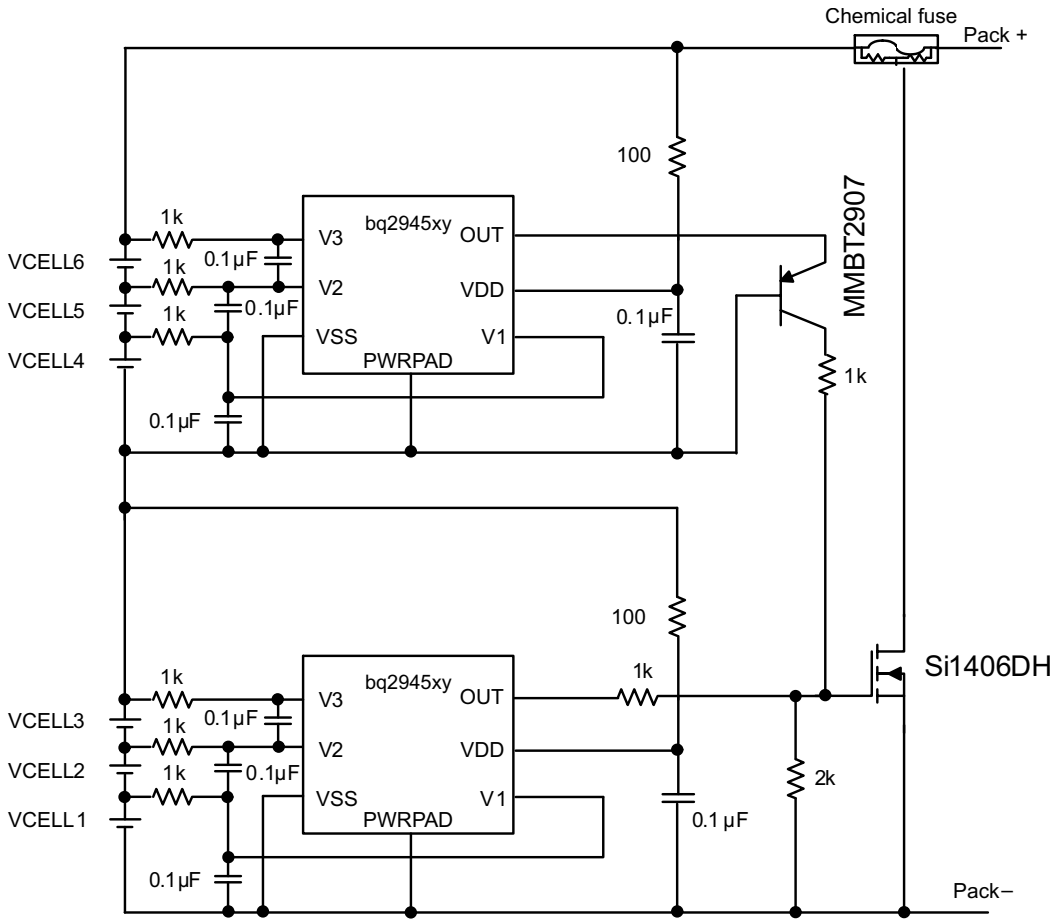

Figure 1. bq2945xy: Application Schematic for Monitoring and Protection of up to 6-Cell Configuration

The bq2945xy family of devices has an internal fixed hysteresis and trigger delay timer. Once any one of the cells exceeds the V_{OVP} threshold, the internal timer is activated. There are four options for this delay timer: 3 s, 4 s, 5.5 s, or 6.5 s. If the V_{OVP} condition exists for a period longer than this delay timer, V_{OUT} goes from inactive to active state. The system with the configuration shown in Figure 2 interrupts the power delivery from the battery pack to the system load by an open circuit condition on the chemical fuse.

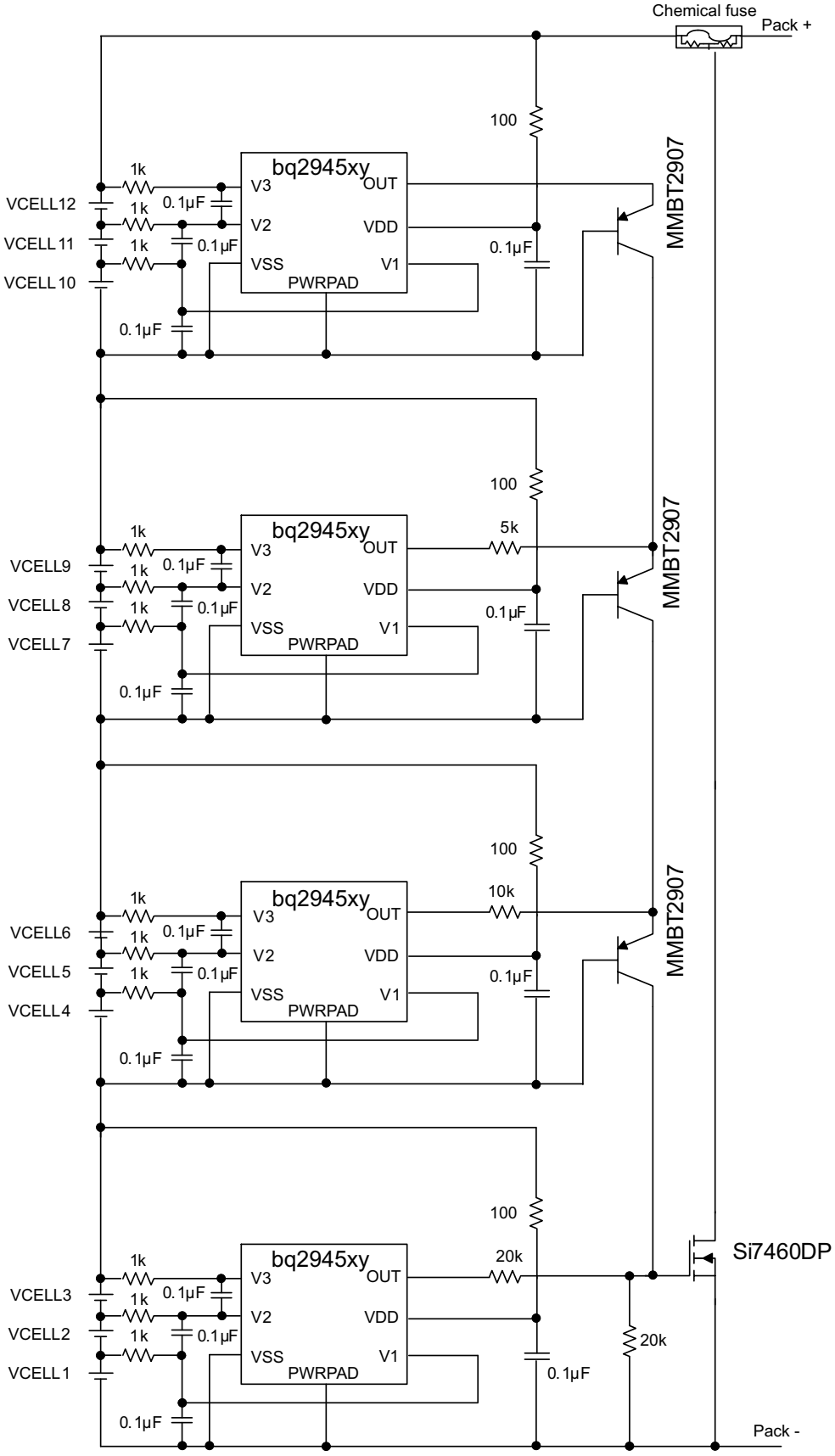

Figure 2. bq2945xy: Application Schematic for Monitoring and Protection of up to 12-Cell Configuration

2.2 bq2947xy Circuit Configurations

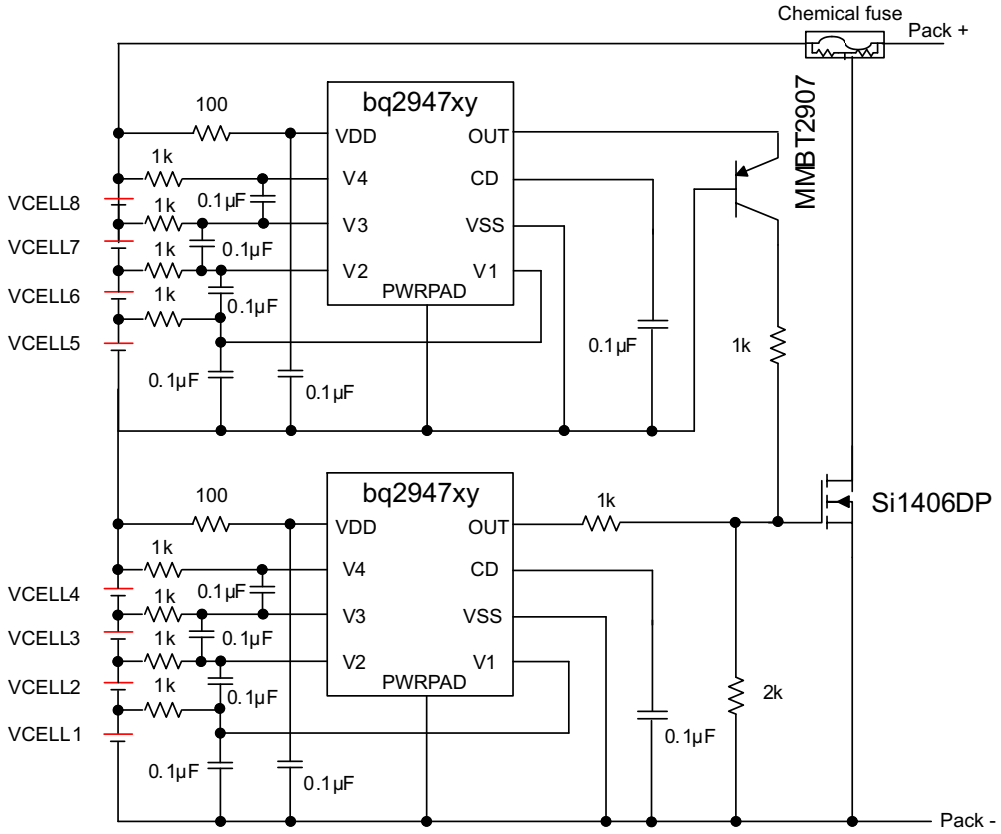

Figure 3. bq2947xy: Application Schematic for Monitoring and Protection of up to 8-Cell Configuration

The bq2947xy family of devices has an option of different fixed hysteresis (factory programmed) and programmable trigger delay timer. Once any one of the cells exceeds the V_{OVP} threshold, the timer is activated. There is an option to select a fixed timer with a min-to-max tolerance of 20 ms to 170 ms by connecting the CD terminal to VSS. If the V_{OVP} condition exists for a period longer than this delay timer, the V_{OUT} goes from inactive to active state. The system with the configuration shown in Figure 4 interrupts the power delivery from the battery pack to the system load by an open circuit condition on the chemical fuse.

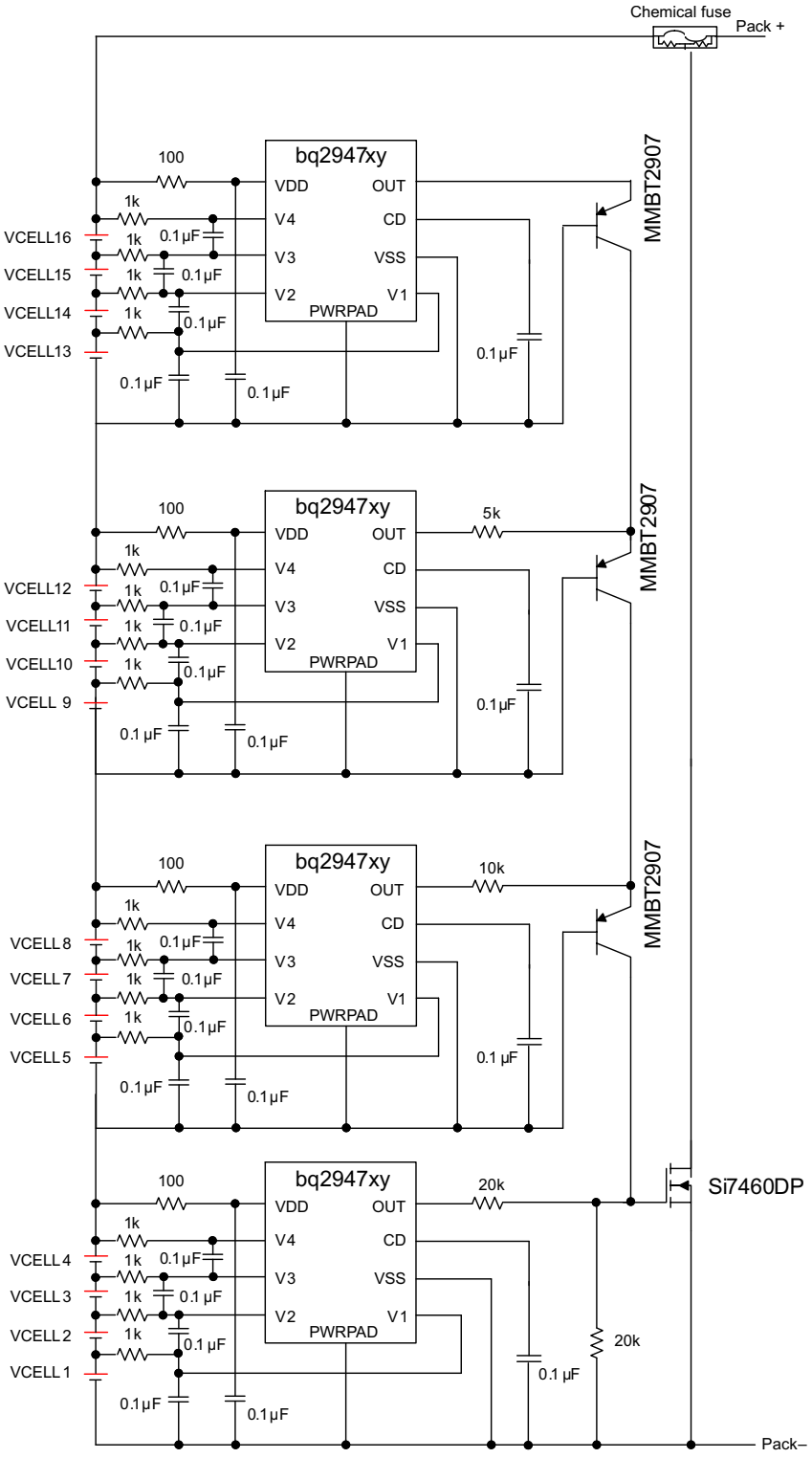

Figure 4. bq2947xy: Application Schematic for Monitoring and Protection of up to 16-Cell Configuration

3 Delay Timer

If the CD terminal is connected to VSS, the delay is fixed ≈ 20 ms to 175 ms. See the *bq2947xy Overvoltage Protection for 2-Series to 4-Series Cell Li-Ion Batteries with External Delay Capacitor Data Sheet* (SLUSB15) for more information.

Programmable delay: Use a capacitor on the CD terminal to ground. The recommended capacitor range is 0.1 µF to 1 µF.

To calculate the delay, use the following equation:

tCD (sec) = K * CCD (µF), where K = 10 to 20 range. (1)

Example: If CCD= 0.1 µF (typical), then the delay timer range is:

t_{CD} (sec) = 10 * 0.1 = 1 s (Minimum)

t_{CD} (sec) = 20 * 0.1 = 2 s (Maximum)

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