NCS35011 Evaluation Board User’s Manual

NCS35011EVK

Introduction

This user’s manual provides information regarding the configuration and method to test the NCS35011 IC. The evaluation board serves as a demonstration of NCS35011 general functionality. NCS35011 manages lithium-ion batteries from 3 to 5 cells in series with accurate battery indication through 3 to 5 LED outputs. Each cell in the battery pack is monitored for an over-voltage (OV) and under-voltage (UV) condition. Upon detecting an over-voltage, the ODI pin will assert indicating a fault condition and stay asserted until the fault is cleared. During an under voltage condition, the UDI pin will also assert indicating the fault but will have a pulse width that is pre-set in the protector. Both OV and UV detections have a hard coded pre-set delay time before fault indication.

Figure 1. NCS35011 Evaluation Board

Features

- Over-Voltage (OV) and Under-Voltage (UV) Detection
- Protection for 3, 4 and 5 Series Cells
- State of Charge (SoC) Indication with High Voltage Tolerant LEDs for 3, 4, and 5 LED Options
- Configurable Fault Outputs (Push-Pull or Open Drain Active High or Low)
- High-Accuracy Voltage Measurement ±5 mV
- Low Power Consumption $I_{CC} = 4 \mu A$
- Input BAT Voltage Range 4 V to 25 V, Tolerant to 65 V for Increased Immunity to Surge
- Extended Junction Temperature Range to 125°C

Quick Start

Recommended Setup

Before beginning, the following setup is needed:

- DC power supplies to generate the battery cell voltages.
- A single DC power supply and five SMD (Rt1–Rt5) or external test resistors to generate the voltage divided cell voltages.
- Two external Pull–up resistors for UDI and ODI pin open–drain configuration test.
- Function generator to generate the cell level over voltage or under voltage.
- Oscilloscope.
- Digital Multi–meter.
Board Setup

Step 1:
Identify the NCS35011 configurations. Depending on the IC trim, a different J1 (see Purple boxed area in Figure 1) configuration may be required to short the corresponding VC pins to GND to create the 3, 4, or 5 series cells test mode.

Step 2:
Identify the NCS35011 ODI and UDI pin configurations. If IC is configured as Open−drain, external pull−up resistors are needed to connect between CL5 and ODI/UDI (see Green boxed area in Figure 1). It is recommended to limit the UDI and ODI current less than 5 mA.

Step 3:
Jcells jumper is the connector for external power or battery connection. Battery cell voltages can be generated through multiplier DC power supplies or SMD 0603 resistors Rt1 – Rt5 (see Orange boxed area in Figure 1) to create the voltage divided cell voltages.

Step 4:
JBAT jumper (see Yellow boxed area in Figure 1 allow user to measure the quiescent current into the IC BAT pin; J0 jumper (Blue boxed area) allow user to measurement current through all the LEDs.

Step 5:
SMD test points (TP_BAT, TP_VC5, TP_VC4, TP_VC3, TP_VC2, TP_VC1, TP_GND, TP_LD1, TP_LD2, TP_LD3, TP_LD4, TP_LD5, TP_ENB, TP_UDI, and TP_ODI) allow user to probe and measure each IC pins voltage. Refer to the schematic and layout diagrams found in Figure 2 and Figure 3 respectively as needed.
Schematic Diagram

Figure 2. NCS35011 Evaluation Board Schematic
### Table 1. BILL OF MATERIALS

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Designator</th>
<th>Part Number</th>
<th>Value</th>
<th>Footprint</th>
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<tr>
<td>1</td>
<td>U1</td>
<td>NCS35011</td>
<td></td>
<td>TSSOP16</td>
</tr>
<tr>
<td>1</td>
<td>S1</td>
<td>MCR08MT1G</td>
<td></td>
<td>SW-PB</td>
</tr>
<tr>
<td>5</td>
<td>D1–5</td>
<td>APTD1608LZGCK</td>
<td>Green LED</td>
<td>0603</td>
</tr>
<tr>
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<td>C1–5</td>
<td>Capacitor</td>
<td>0.1 μF 35 V</td>
<td>0603</td>
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<tr>
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<td>Cbat1</td>
<td>Capacitor</td>
<td>0805 70/100 V</td>
<td>0805 /1206</td>
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<tr>
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<td>6</td>
<td>R1–5, Rbat</td>
<td>Resistor</td>
<td>1 k</td>
<td>0603</td>
</tr>
<tr>
<td>1</td>
<td>Renb</td>
<td>Resistor</td>
<td>10 k</td>
<td>0603</td>
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<td>5</td>
<td>Rled1–5</td>
<td>Resistor</td>
<td>12 k</td>
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<td>TB002–500–06BE</td>
<td>Terminal block</td>
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<td></td>
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<tr>
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<td>Header Connector</td>
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<td>P_EXT</td>
<td>Header Connector</td>
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<td>TP_GND</td>
<td>Test Loop</td>
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<td>Through Hole</td>
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