



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.

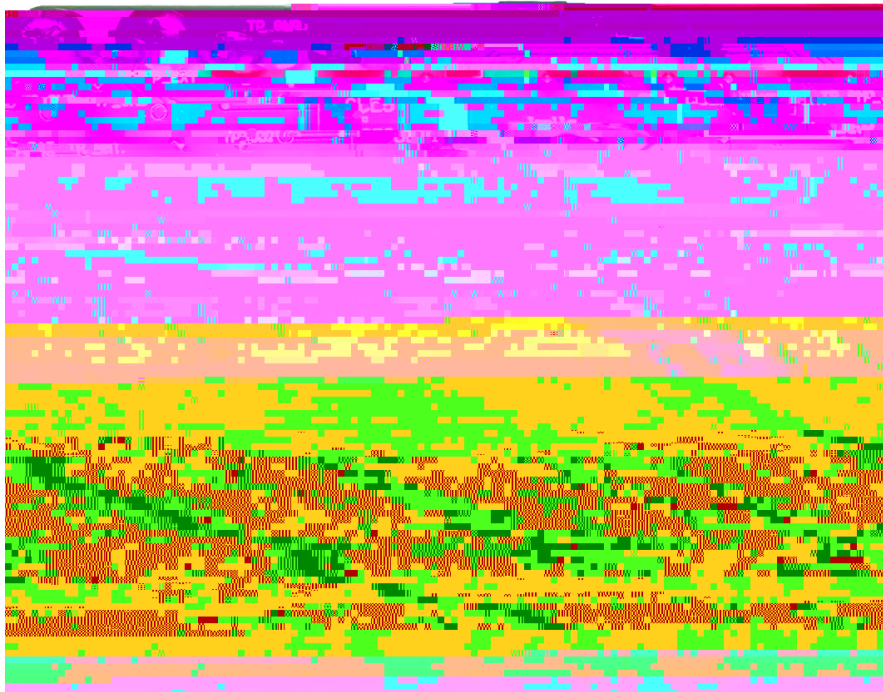


Figure 1. NCS35011 Evaluation Board

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.

NCS35011EVK

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.

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SCHEMATIC & LAYOUT DIAGRAMS

Schematic Diagram

NCS35011EVK

Layout Diagram

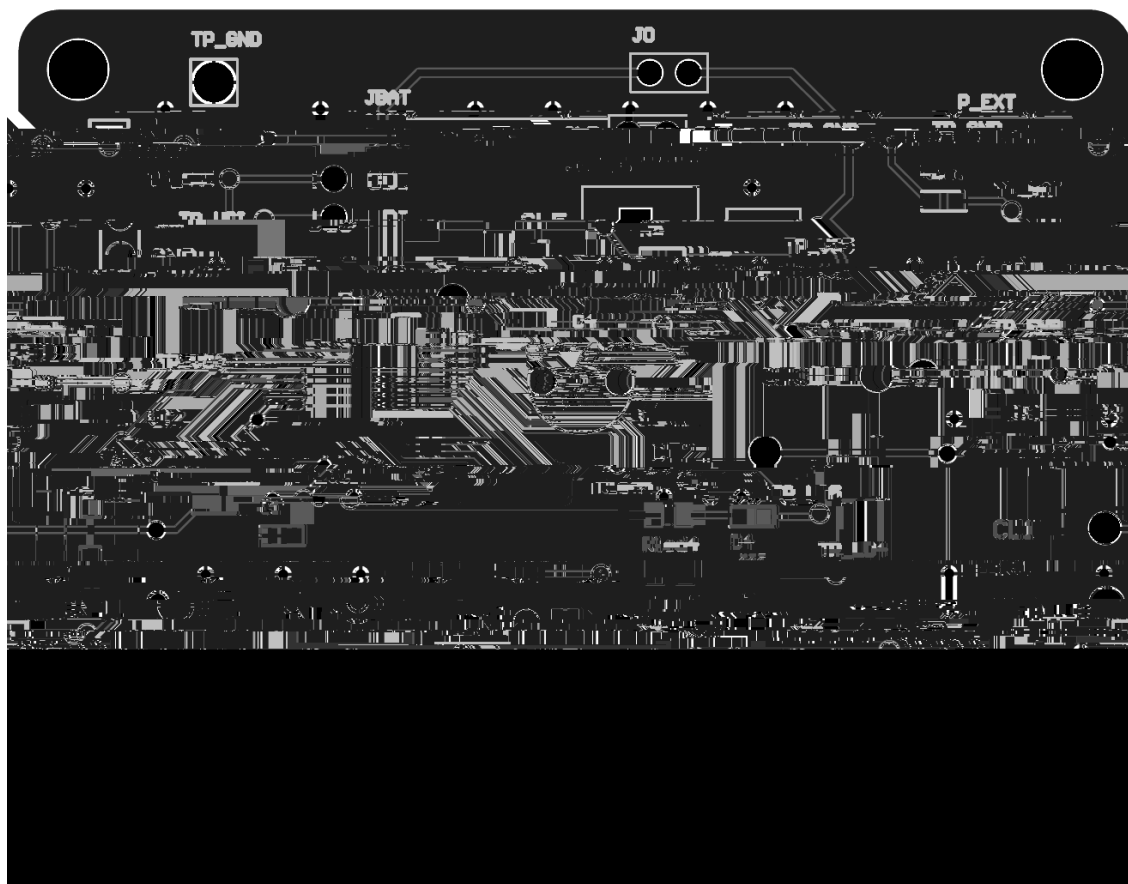


Figure 3. NCS35011 Evaluation Board Layout

Table 1. BILL OF MATERIALS

Quantity	Designator	Part Number	Value	Footprint
1	U1	NCS35011		TSSOP16
1	S1	MCR08MT1G	Switch	SW-PB
5	D1-5	APTD1608LZGCK	Green LED	0603
5	C1-5	Capacitor	0.1 μ F 35 V	0603
1	Cbat1	Capacitor	0805 70/100 V	0805 /1206
1	Cvda1	Capacitor	1 μ F 6 V	0603
6	R1-5, Rbat	Resistor	1 k	0603
1	Renb	Resistor	10 k	0603
5	Rled1-5	Resistor	12 k	0805
1	Jcells	TB002-500-06BE	Terminal block	
1	JBAT, J0	Header Connector	1 x 2	
1	J1	Header Connector	2 x 2	
1	P_EXT	Header Connector	1 x 4	
2	TP_GND	Test Loop		Through Hole

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