

LS0502SCD33 Evaluation Board

Quick Reference Guide

About this document

This Evaluation Board (EVB) quick reference guide describes an advanced linear charger to 2 cells super capacitor storage load. It contains the EVB specification, PCB layout, schematic, bill of materials (BOM), and LEDs indication function.

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1. Introduction

The LS0502SCD33 protection IC provides a complete solution designed for systems with backup storage capacitors or the capacitor bank. This integrated system implements essential features such as input overvoltage and overcurrent protection circuits, a reverse blocking switch, and a super capacitor charging control circuit. Additionally, it includes a built-in cell balance mechanism that ensures protection and optimal performance for dual-cell super capacitor systems. With these capabilities, the LS0502SCD33 offers a reliable and efficient solution for managing energy storage and safeguarding the system components.

The LS0502SCD33 is an advanced linear charger. It provides a constant current to charge the super capacitors. It also offers the following functions, programmable super capacitor charging current, programmable input current, programmable input overcurrent, protection automatic cell balancing and automatic main/backup switchover.

LED indicators are used to display the operational mode of the IC.

2. LS0502SCD33 Evaluation Board (EVB)

This section covers LS0502SCD33 load switch evaluation board, PCB layout, schematic and BOM.

Figure 1. LS0502SCD33 evaluation board



2.1 PCB layout

The top-side of the board is shown in Figure 2, and the bottom side in Figure 3.

Figure 2. Top-side copper and component

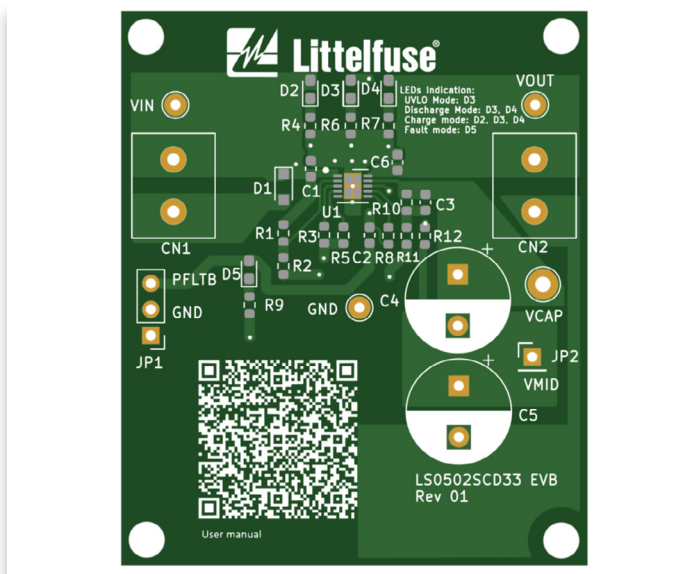
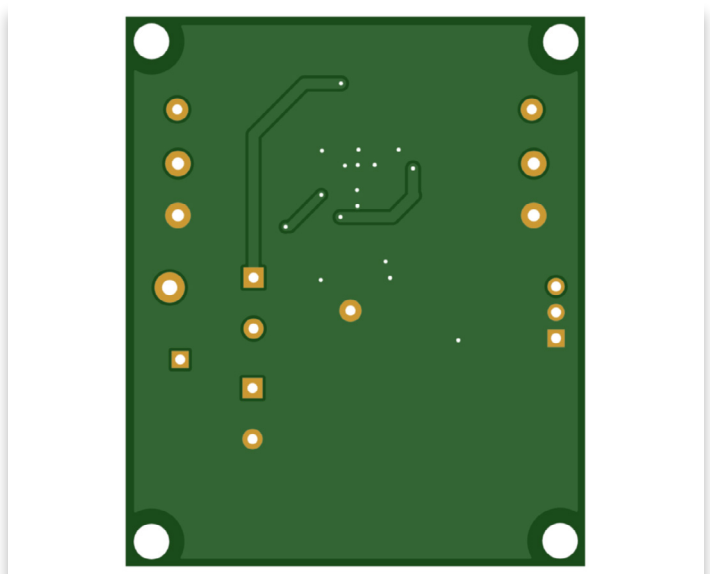


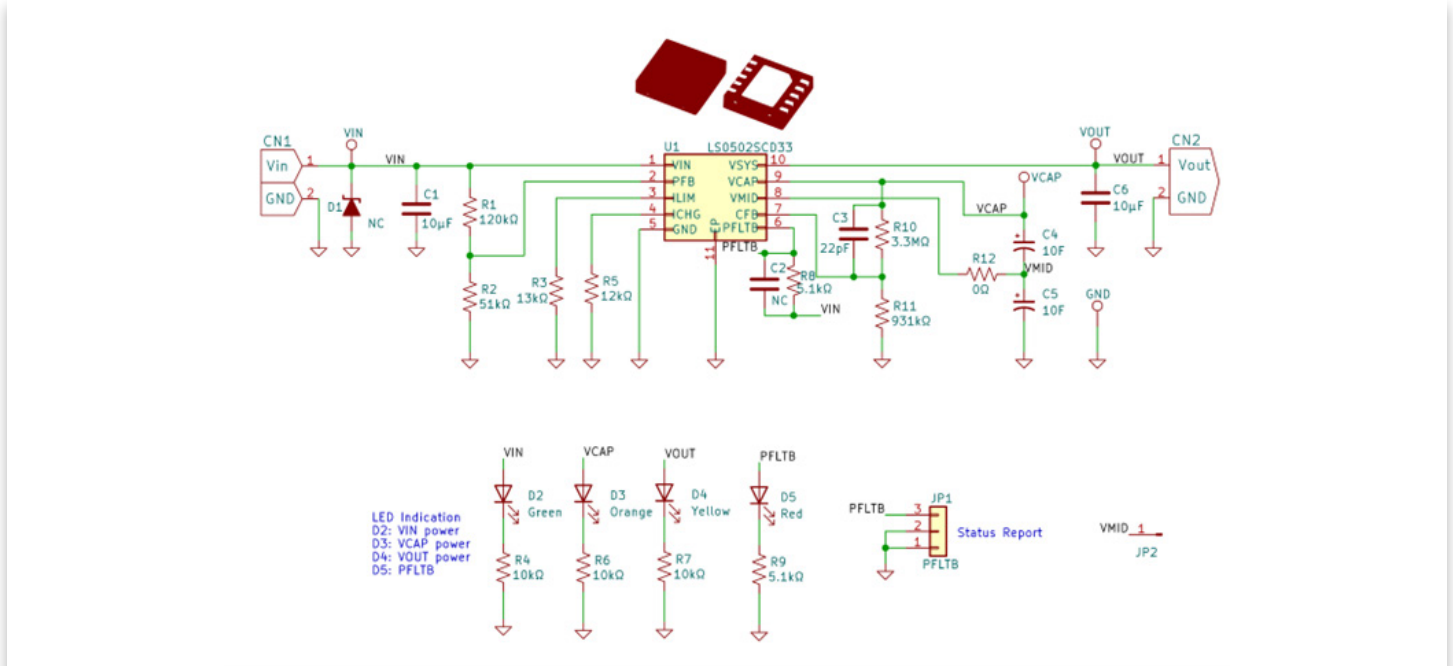
Figure 3. Bottom-side copper



2.2 Schematic

Figure 4 provides the EVB schematic. The jumpers are highlighted. See Figure 5 for the jumper locations on the board.

Figure 4. Schematic



2.3 BOM

Table 1 provides the EVB bill of materials (BOM).

Table 1. BOM

| Item | Qty | Reference Designator | Description | Part number | Manufacturer | Package Size |
|------|-----|----------------------|------------------------------------|-------------------|--------------------|-----------------------------|
| 1 | 1 | R1 | RES 120K OHM 1% 1/10W 0603 | RC0603FR-13120KL | YAGEO | 0603 |
| 2 | 1 | R2 | RES 51K OHM 1% 1/10W 0603 | RC0603FR-0751KL | YAGEO | 0603 |
| 3 | 1 | R3 | RES 13K OHM 1% 1/10W 0603 | RC0603FR-0713KL | YAGEO | 0603 |
| 4 | 3 | R4, R4, R7 | RES SMD 10K OHM 1% 1/10W 0603 | AT0603FRE0710KL | YAGEO | 0603 |
| 5 | 1 | R5 | RES 12K OHM 1% 1/10W 0603 | RC0603FR-105K1L | YAGEO | 0603 |
| 6 | 2 | R8, R9 | RES 51K OHM 1% 1/10W 0603 | AT0603FRE0710KL | YAGEO | 0603 |
| 7 | 1 | R10 | RES 3.3M OHM 1% 1/10W 0603 | RC0603FR-073M3L | YAGEO | 0603 |
| 8 | 1 | R11 | RES 931K OHM 1% 1/10W 0603 | RC0603FR-07931KL | YAGEO | 0603 |
| 9 | 1 | R12 | RES 0 OHM JUMPER 1/10W 0603 | RC0603FR-070RL | YAGEO | 0603 |
| 10 | 2 | C1, C6 | CAP CER 10UF 10V X5R 0603 | CC0603MRX5R6BB106 | YAGEO | 0603 |
| 11 | 1 | C3 | CAP CER 22PF 50V C0G/NPO 0603 | CC0603JPNPO9BN220 | YAGEO | 0603 |
| 12 | 2 | C4, C5 | Super CAP 3V 10F | WEC3R0106QA | PAC ELECTRONICS | P10x25 |
| 13 | 1 | D2 | LED GREEN CLEAR SMD | LTST-C191KGKT | LITEON | 0603 |
| 14 | 1 | D3 | LED ORANGE CLEAR SMD | LTST-C191KFKT | LITEON | 0603 |
| 15 | 1 | D4 | LED YELLOW CLEAR SMD | LTST-C191KSKT | LITEON | 0603 |
| 16 | 1 | D5 | LED RED CLEAR SMD | LTST-C191KRKT | LITEON | 0603 |
| 17 | 1 | U1 | SUPER CAPACITOR PROTECTION IC | LS0502SCD33 | LITTELFUSE | DFN3x3_10L |
| 18 | 4 | Vin, Vout, Vcap, GND | PCB TEST POINT | 4697 | CENTENARY MATERIAL | HOLE ϕ 0.8~ ϕ 1.0 |
| 19 | 2 | CN1, CN2 | TERMINAL BLOCK, PLUGGABLE, 2P 5.08 | AMB310-508M2 | TUN-HWA MATERIAL | 2Px 5.08mm |

3. Function Setting

The current Limit, charging current setting, input voltage sensing and stop charging voltage, as defined in Table 2.

Table 2. EVB function list

| Functions | Value |
|-------------------------------|-------|
| Current Limit (A) | 2.3 |
| Charging Current (A) | 0.275 |
| Input Low Voltage Sensing (V) | 4.02 |
| Stop Charging Voltage (V) | 5.03 |

- Use the following equation to calculate the current limit value

$$ILIMIT = 30A * k\Omega / RLIMIT$$

- Use the following equation to calculate the charging current value

$$ICHG = 3.3A * k\Omega / RCHG$$

- Use the resistors and the voltage divider to set input low voltage value and the reference voltage is 1.2 V.
- Use the resistors and the voltage divider to set stop charging voltage value and the reference voltage is 1.1 V.

4. Connectors, Jumpers and LEDs Indication

To configure the EVB for operation, reference Table 3. This table lists a summary of the EVB's connectors, jumpers and LEDs. The location of the connectors and jumpers are shown in Figure 5.

Figure 5. EVB connector and jumpers

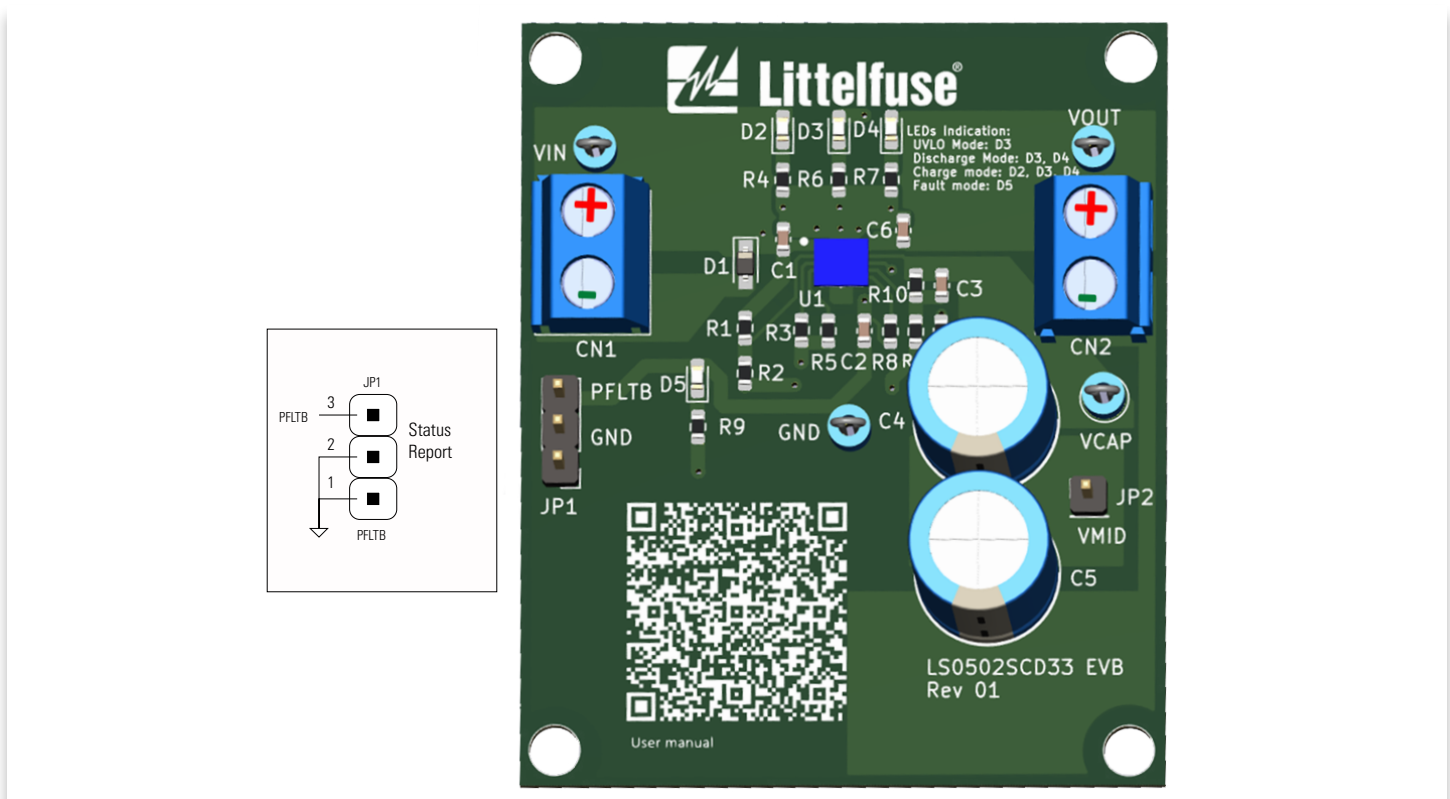


Table 3. Connectors and Jumper

| Connector | Description |
|--------------|--|
| CN1 for Vin | DC positive pin (Vin+) and Ground (GND) pin |
| CN2 for Vout | DC positive pin (Vout+) and Ground (GND) pin |

| Jumper Options | Description |
|----------------|-------------------------------------|
| JP1 | Input power failure indicator |
| JP2 | Two capacitors middle point voltage |

Table 4. EVB LED summary list

| LED | Description |
|-----|---|
| D2 | Vin powerpin |
| D3 | Vcap power |
| D4 | Vout power |
| D5 | off when the PFB drop below 1.2 V or (Vin-Vout) exceed 360 mV |

Note: EVB LEDs indication are as shown in Table 4.