AeroSense engineering evidence

Technical summary of reviewed design correspondence, historical CAD and a subsequent amplifier diagnostic. This document separates proposals, archived geometry and reported observations; it is not a test certificate.

1. Refine the power and measurement architecture

The team requested removal of the Raspberry Pi interface while retaining the photodiode, LMP7721 TIA and ADC measurement path. The reviewed requirements added single-cell charging and power-path management, a regulated 5 V boost rail, a physical ON/OFF control and ESP32 programming/debug access. Switching power components were to be kept away from the small-signal analog region.

The correspondence records a symbol-pin mismatch and asks for correction against the LMP7721 pinout, with 100 MΩ feedback in parallel with 2.2 pF. These are design instructions, not a measured claim of leakage or noise improvement. [B: pp. 5, 7]

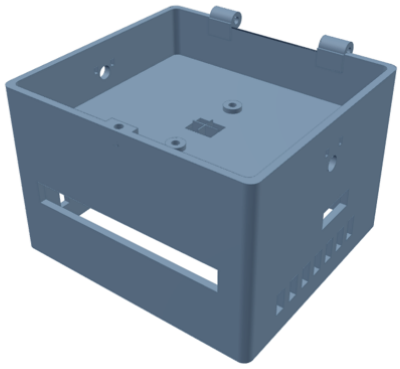
Initial proposal	Revised control
A switch followed the TPS61023 5 V output. Battery undervoltage logic controlled EN.	The user switch and battery undervoltage logic feed an AND gate controlling TPS61023 EN.

The revised block diagram changes the enable-control relationship. The source does not provide standby-current measurements or an electrical validation of the assembled board. [A: pp. 1-2]

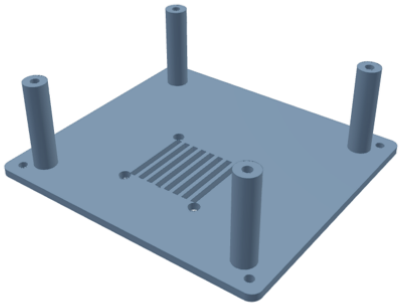
Roles and evidence

The student team specified sensing requirements and supplied the initial circuit. iST contributed professional circuit/layout review and manufacturing preparation. The preliminary schedule in correspondence B is an estimate, not evidence that the listed production or QC stages were completed. [B: pp. 1-2]

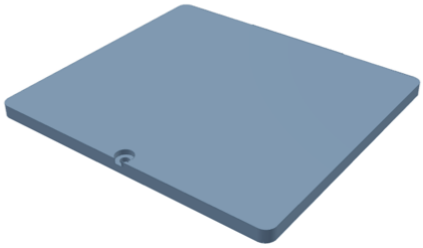
2. Inspect the historical mechanical design



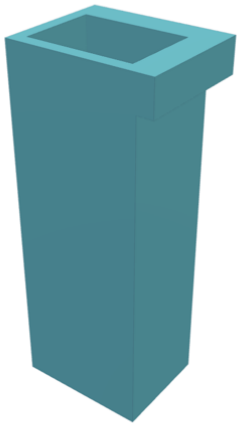
Integrated body
114 × 109 × 81 mm



Service tray
114 × 104 × 44 mm

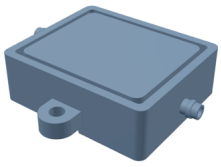


Hinged lid
114 × 109 × 9 mm

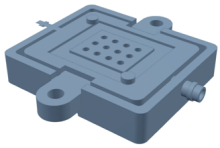


One of four separate wells
6.5 × 5.2 × 15.8 mm

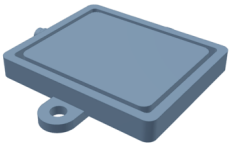
Original triangulated geometry is retained. Views are independently centered and framed; this is a parts inspection, not reconstructed assembly placement. STL files do not encode units; dimensions follow the millimetre convention of the existing CAD workflow.



Original one-piece cap
46 × 46 × 12.2 mm



Alternative lower piece
46 × 46 × 8.6 mm



Alternative upper piece
42 × 46 × 6.1 mm

The optional lower and upper pieces replace the one-piece cap. The source README specifies two M3 × 12 thumbscrews instead of M3 × 10 and an extra silicone ring: 22 × 19 mm outer boundary, 15 × 12 mm opening, 0.8 mm stock compressed to 0.6 mm. The intended change improves access for cleaning and curing; sealing and biocompatibility were not validated. [C]

3. Keep the unresolved diagnostic visible

The existing bench record reported ADC code 32767 and approximately 3.15 V at the ADC input under three illumination conditions. The fixed code alone did not establish saturation, and analog/digital agreement remained a separate check.

A subsequent partner update reports that changing the TIA feedback resistance from 100 MΩ to 10 kΩ still produced output saturation. Inspection then found the TIA inverting input shorted to ground. The update explicitly states that the cause was still being investigated. [D]

This supports a change in the diagnostic question: lowering gain did not resolve the reported output state, so the input-node connection requires investigation. It does not establish where the short originated, whether it was repaired, or whether a post-repair optical measurement succeeded.

Proposed next verification

Locate and resolve the reported short, then compare the analog node and ADC reading under the same dark, covered-detector and illuminated-detector conditions. Confirm a repeatable light-dependent response before comparing a blank and fluorescent standard. These are proposed checks; no successful repair is inferred.

Source map and public scope

[A] Technical correspondence A (email01.pdf), 328-page private source; relevant complete pages 1-2 reviewed visually. [B] Technical correspondence B (email02.pdf), 7-page private source; complete relevant pages 1-2, 5 and 7 reviewed visually. [C] Archived AeroSense v1 STL directory and optional-cap README. [D] Supplied partner diagnostic screenshot, technical paragraph reviewed visually.

The public diagrams and this document are newly authored technical summaries. Private addresses, recipient lists, signatures and unrelated invoice discussion are omitted. Original correspondence remains with the team. CAD hashes, extents and exact triangle counts are preserved in the accompanying source manifest.