Grinn EvseSOM EVB

1 Features

- CP interface available on a dedicated connector and goldpins
- CP switches for state manipulation capable of simulating states A, B, C, D and E states according to IEC 61851-1
- PP interface available on a dedicated connector and goldpins
- PP switches for resistance manipulation capable of simulating 12A, 20A and 30A cable current capacities according to IEC 61851-1
- EvseSOM™ UART interface exposed via a dedicated connector and goldpins
- Test points for each important signal and numerous debug headers
- Flexible power supply options: 5V input via USB-C, DC Jack, or terminal block

2 Applications

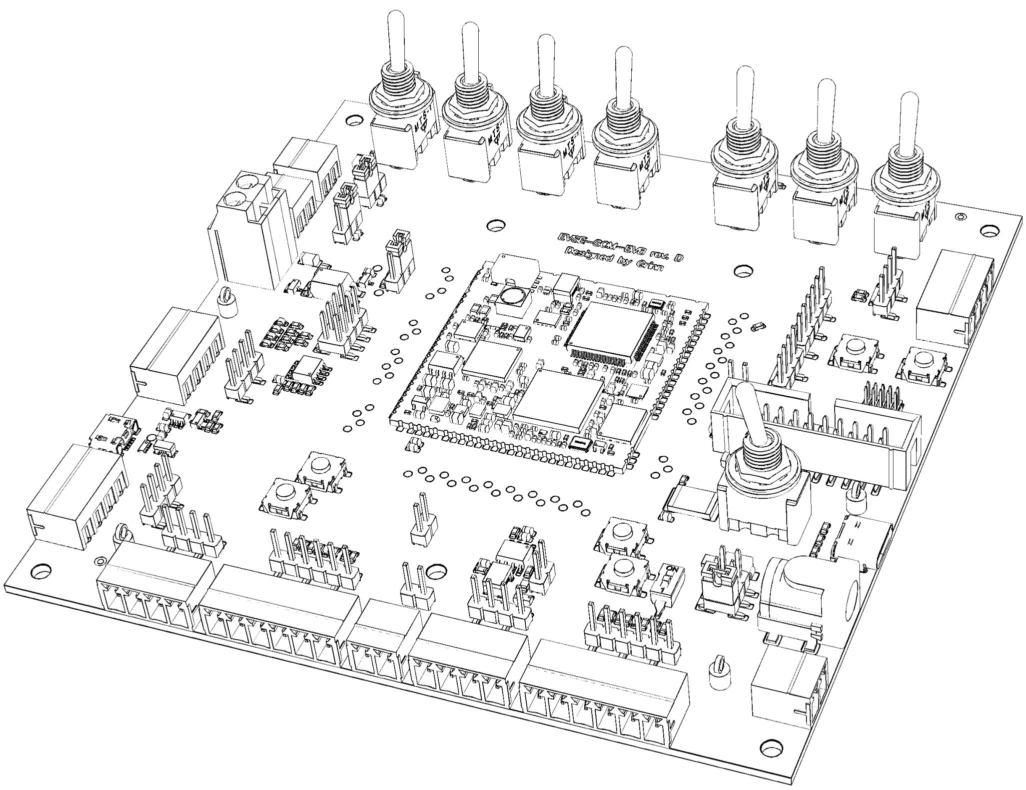
- EvseSOM™ integration and evaluation

3 Description

The Evaluation Board (EVB) for the EvseSOM™ module streamlines the integration of Electric Vehicle (EV) charging systems compliant with **ISO 15118-2**, **ISO 15118-20**[1], and **IEC 61851-1**. It serves as a bridge between the EvseSOM™ and a host application or PC, providing communication through a standard UART interface.

To support comprehensive EVSE (Electric Vehicle Supply Equipment) simulation, the board features dedicated terminals for direct connection to the CP (Control Pilot) and PP (Proximity Pilot) lines.

Furthermore, integrated hardware switches allow users to simulate basic EV states (A, B, C, D, and E according to IEC 61851-1) as well as charging cables with various current ratings.



[1]Availability is planned for the end of 2026 and subject to change.

Contents

4 About EvseSOM™

The EvseSOM™ is a highly integrated System-on-Module (SOM) designed to serve as the core of a Supply Equipment Communication Controller (SECC) for eMobility applications.

It is driven by an **NXP i.MX RT1061** processor and a **Lumissil IS31CG5317** transceiver, acting as a bridge between the vehicle charging interface and a host application processor.

The module simplifies EVSE design by providing a complete software stack for global charging standards, including **ISO 15118**, **DIN 70121**, and **IEC 61851-1**, while operating from a single 5 V power supply.

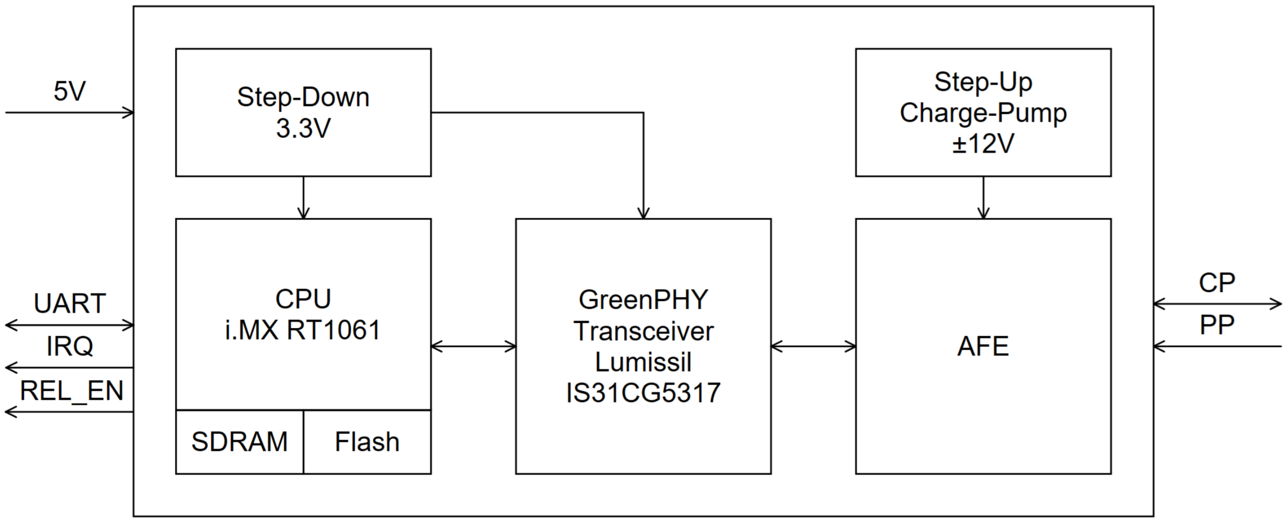


Fig. 1: EvseSOM™ block diagram

5 About EvseSOM EVB™

The EvseSOM EVB™, built around the EvseSOM™, is a comprehensive development platform designed for rapid prototyping and evaluation of eMobility charging applications. It enables developers to quickly start working with different EvseSOM™ variants by providing all required interfaces, power management, and communication peripherals in a ready-to-use environment.

Operating from a single 5V power supply, the EvseSOM EVB™ significantly accelerates development, debugging, certification preparation, and proof-of-concept creation for EVSE charging systems.

The EvseSOM EVB™ includes dedicated switches for simulating EV states on the Control Pilot line and separate switches for simulating maximum cable current capacity on the Plug Present signal. All necessary signals for connecting the EvseSOM™ to the HOST system are available on goldpin connectors as well as on a dedicated terminal blocks.

6 Power Supply and Input Source Selection

The EvseSOM EVB™ incorporates a flexible power management section designed to accept power from three distinct input sources. This multi-source topology allows the board to be powered seamlessly in laboratory environments, field test setups or integrated industrial enclosures.

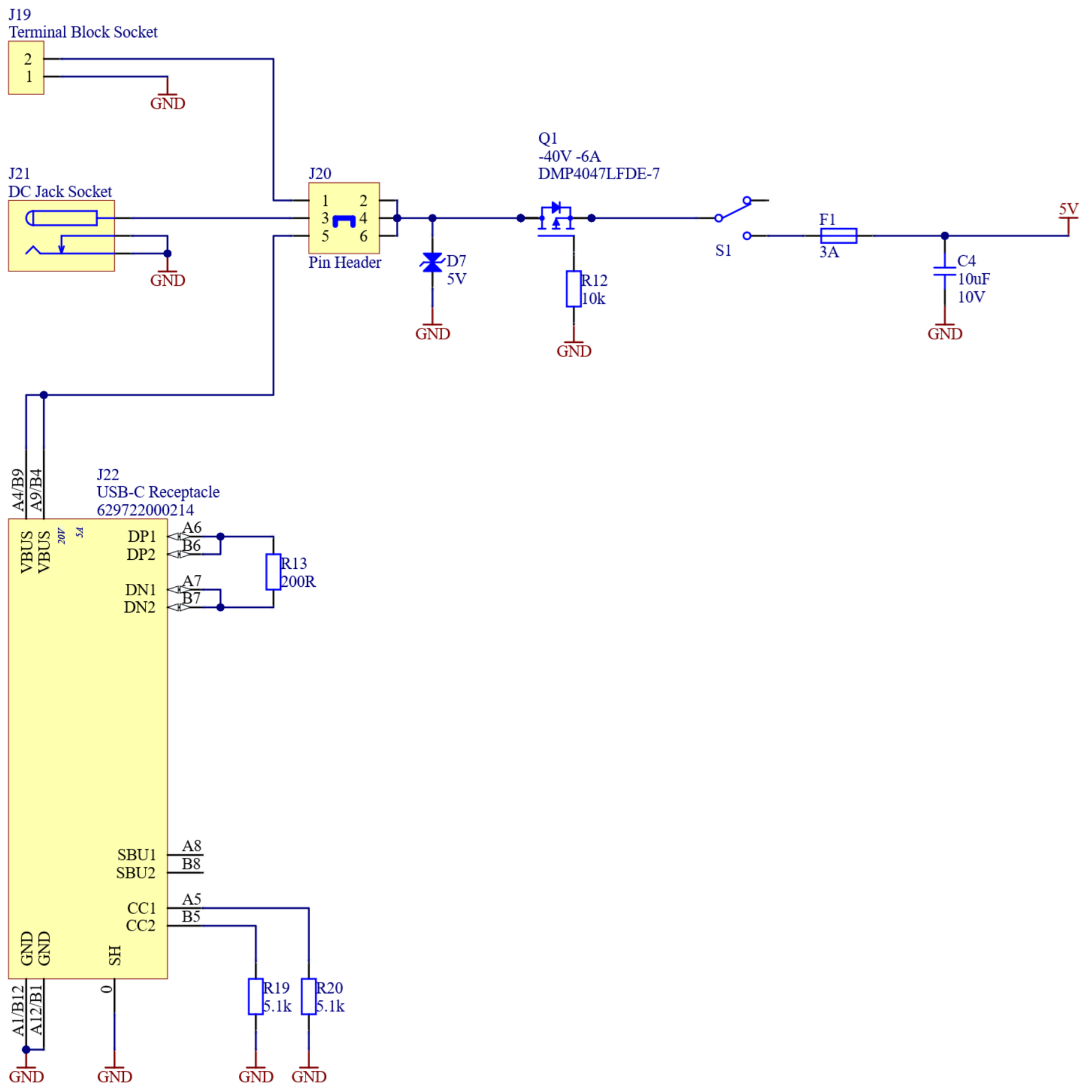


Fig. 2: Power supply selection and input stage schematic

The primary power rail operates at 5V, which is subsequently distributed to on-board voltage regulators and sub-circuitries. A physical toggle switch and hardware protection elements ensure controlled power distribution and reverse-voltage immunity.

The status of each power rail, including both the input supply and the rails generated internally by the EvseSOM™ module, can be monitored using four dedicated LEDs:

- **D10** – main 5 V supply
- **D8** – 3.3 V rail generated by the EvseSOM™ module
- **D11** – +12 V rail generated by the EvseSOM™ module
- **D12** – -12 V rail generated by the EvseSOM™ module

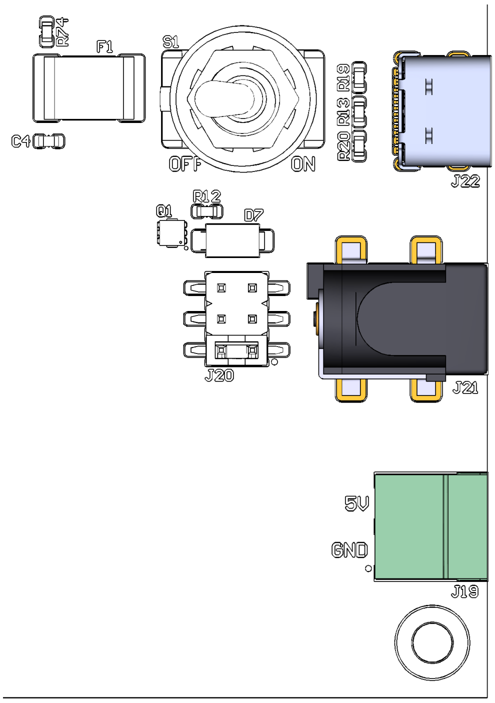


Fig. 3: Power supply connectors

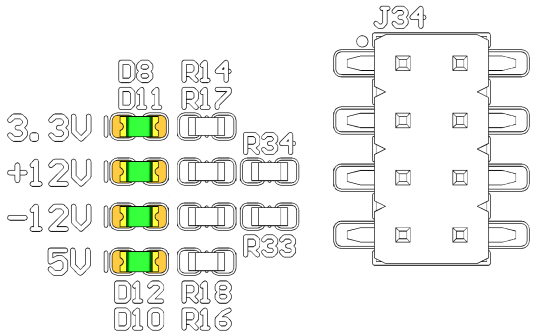


Fig. 4: Power indicators

The power delivery network converges at the **J20 Pin Header**, which serves as the central hardware node for input selection. The three selectable power sources include:

- **External Power Supply** – secure 2-pin terminal block socket designed for connecting an external laboratory power supply or industrial DC rail (5V reference).
- **DC Jack Socket** – standard barrel jack connector allowing the board to be powered via a conventional 5V AC/DC wall adapter.
- **USB-C Receptacle** – USB Type-C interface that pulls power directly from a connected host PC, laptop, or standard USB power bank. The USB-C configuration pins are tied to ground through 5.1kΩ pull-down resistors to successfully advertise and negotiate a stable 5V supply from downstream USB-PD power sources.

To prevent power back-feeding or conflicting voltage sources from damaging connected equipment, the selection is managed via the 6-pin **J20 Pin Header**. By placing a physical jumper across the appropriate pins, a single input rail is safely routed to the downstream system switch.

The configuration matrix for source selection is outlined in Table 1.

Tab. 1: J20 Input Power Selection Configuration

Jumper Position	Connector Reference	Selected Power Source
1–2	J19 Terminal Block Socket	External Power Supply
3–4	J21 DC Jack Socket	AC/DC Wall Adapter
5–6	J22 USB-C Receptacle	USB Host / Power Bank

7 Interfaces Towards the Host Processor

The following sections describe each interface available on the EvseSOM EVB™, including their functionality, connector definitions and intended use cases.

7.1 Reset Signals

The following figures illustrate the reset circuit and the physical reset button used to reset the EvseSOM™ module on the EvseSOM EVB™.

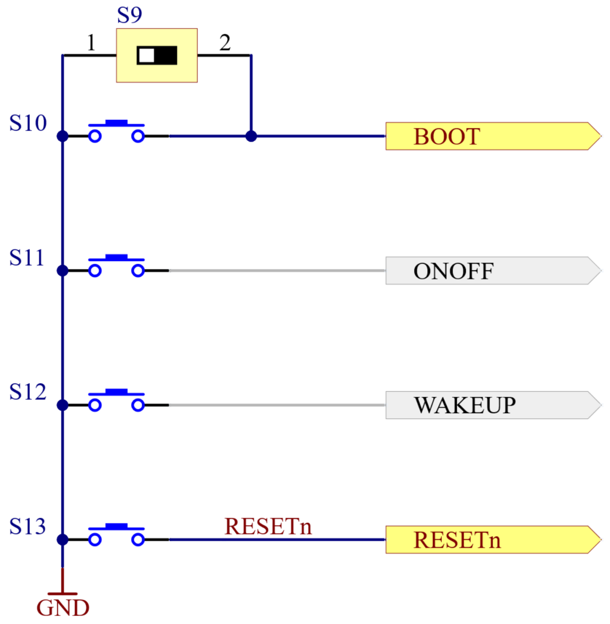


Fig. 5: Reset circuit

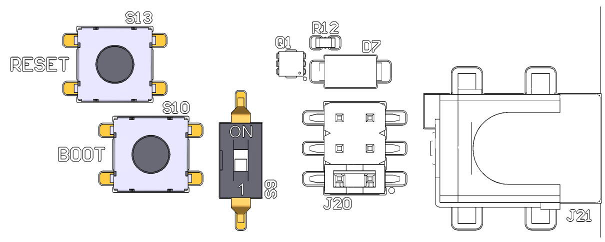


Fig. 6: Reset button

7.2 Interrupt Signal

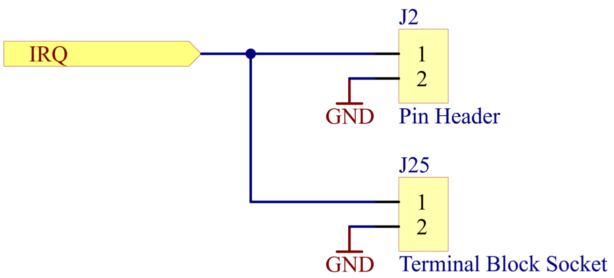


Fig. 7: IRQ signal circuit

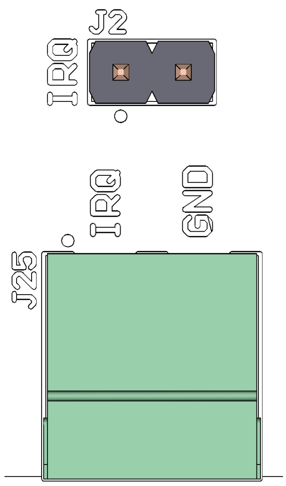


Fig. 8: IRQ signal connectors

The EvseSOM™ interrupt line is connected to both the J2 goldpin connector and the J25 terminal block.

7.3 UART interface

The EvseSOM EVB™ provides a low-power Universal Asynchronous Receiver-Transmitter interface based on the UART peripheral. This port is primarily utilized as the main industrial communication interface supporting the Modbus RTU protocol, enabling the board to interface with external modules.

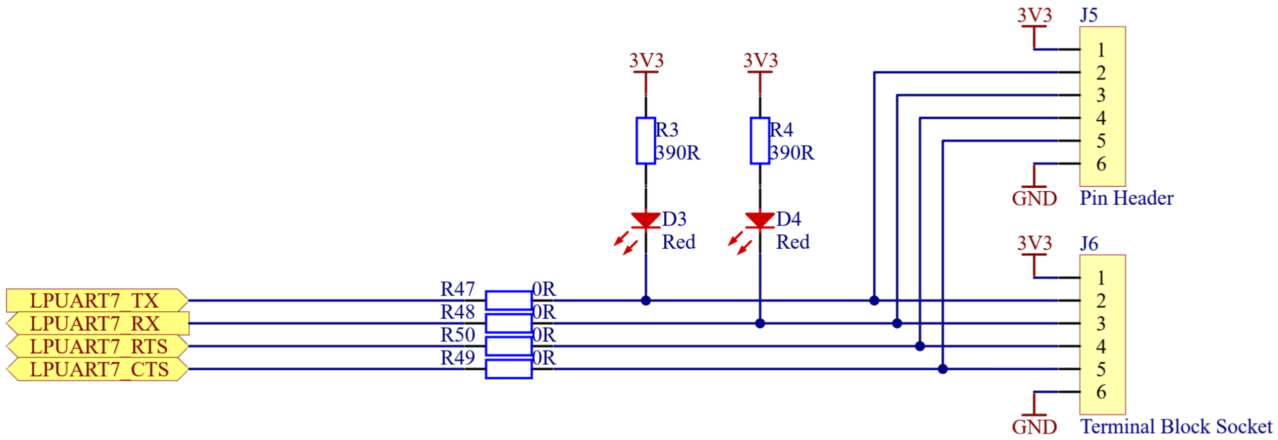


Fig. 9: UART communication interface schematic

The transceiver lines are dual-routed to two parallel physical connectors to maximize flexibility during testing and integration:

- **J5 (Pin Header)** – Standard 2.54 mm male pin header, ideal for logic analyzers, oscilloscopes or quick jumper wire connections.
- **J6 (Terminal Block Socket)** – Screwless terminal block designed for secure and robust industrial field wiring.

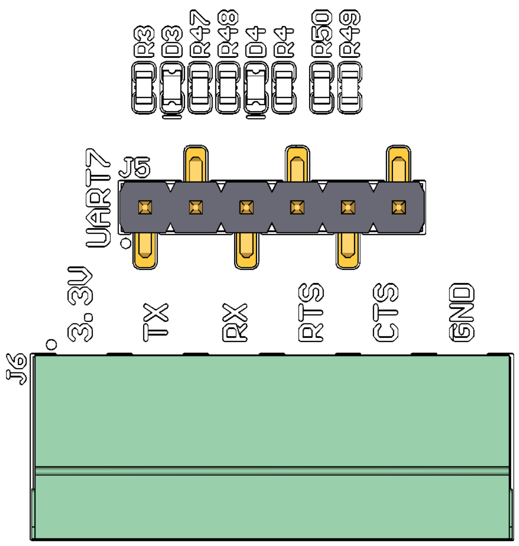


Fig. 10: UART communication interface connectors

The UART interface of the EvseSOM EVB™ provides two dedicated LEDs (D3 and D4) for monitoring communication.

7.3.1 Signal Direction and Pinout Assignment

Both connectors share an identical pinout layout mapping power, signal lines and reference ground. The signal distribution and explicit transmission directions relative to the EvseSOM™ microcontroller are detailed in Table 2.

[1] UART RTS/CTS connection is not required, as hardware flow control is not used by the software.

Tab. 2: UART Connector Pinout and Signal Directions

Pin No.	Signal Name	Direction	Functional Description
1	3V3	Power Out	Auxiliary 3.3 V DC supply for external voltage reference
2	UART_TX	Output	Transmit Data line (serial data output from MCU)
3	UART_RX	Input	Receive Data line (serial data input to MCU)
4	UART_RTS	Output	Request to Send (hardware flow control handshake line)
5	UART_CTS	Input	Clear to Send (hardware flow control handshake line)
6	GND	–	Common signal and power reference ground

7.4 Relay Enable Safety Interlock

The EvseSOM EVB™ incorporates a dedicated hardware safety interlock path designated as REL_EN (Relay Enable). This interface is responsible for controlling the main contactor or charging relay that connect grid power to the vehicle's onboard charger. Due to the high voltages involved in EV charging circuits, this path is engineered with redundant safety constraints.

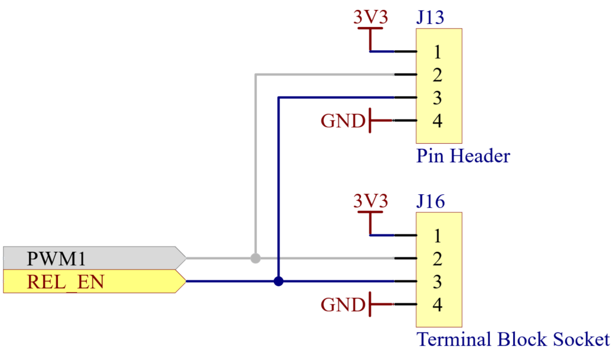


Fig. 11: Relay Enable interface schematics

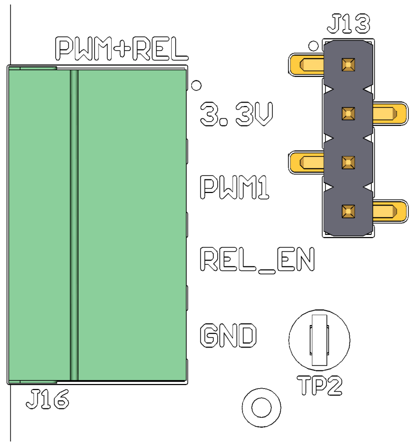


Fig. 12: Relay Enable interface connectors

The interlocking signals are accessible via two parallel output interfaces, allowing flexible connectivity to downstream control logic:

- **J13 (Pin Header)** – A 4-pin male pin header, suitable for monitoring via test benches or prototyping equipment.
- **J16 (Terminal Block Socket)** – A secure 4-pin industrial terminal block connector tailored for reliable field wiring to external contactor driver modules.

7.4.1 Pinout and Signal Interconnect

Both connectors output identical control profiles and auxiliary rails to support external interfacing logic. The exact pin assignment is mapped in Table 3.

Tab. 3: J13 and J16 Interlock Pinout Specifications

Pin No.	Signal Name	Direction	Functional Description
1	3V3	Power Out	3.3 V DC rail for driving external reference voltage
2	PWM1	Output	Not available
3	REL_EN	Output	Dedicated hardware relay enable safety signal
4	GND	–	Common signal reference ground

7.4.2 Logical AND Interlock for Enhanced Safety

To prevent accidental activation of the charging relays caused by software bugs, unexpected MCU resets or hardware pin failures, the closing of the main contactor is gated by a strict logical AND condition.

- **Internal Condition:** The onboard microcontroller must actively evaluate the charging state (verifying a valid Control Pilot state sequence and checking for faults) and drive the internal `REL_EN` pin to a logically HIGH state.
- **External Condition:** The external supervising safety controller, independent safety monitoring loops, or an emergency stop loop must concurrently validate the environment and signal hardware readiness.

Both conditions must be met simultaneously:

$$REL\_EN = REL\_EN_{\text{EvseSOM}} \wedge REL\_EN_{\text{HOST}}$$

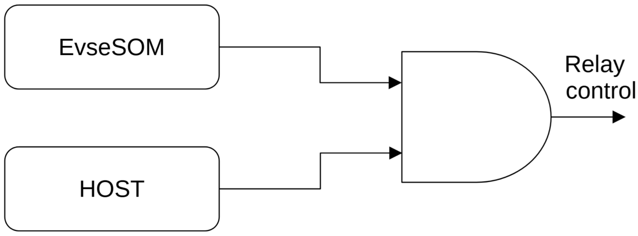


Fig. 13: Relay control block diagram

If either the internal program detects an electrical deviation (such as a CP fault) or the external loop breaks the line, the hardware intersection immediately pulls the contactor command low, interrupting the charging process within milliseconds. This redundant safety loop prevents power delivery if the software hangs or if an external subsystem initiates an emergency shutdown.

8 EVSE Interface

8.1 Control Pilot

The Control Pilot (CP) is a dedicated signaling line used in AC electric vehicle charging systems to establish communication between the Electric Vehicle Supply Equipment (EVSE) and the electric vehicle (EV). It is responsible for essential charging functions such as vehicle detection, charging authorization and communication of the maximum allowable charging current, ensuring safe and controlled operation of the charging process.

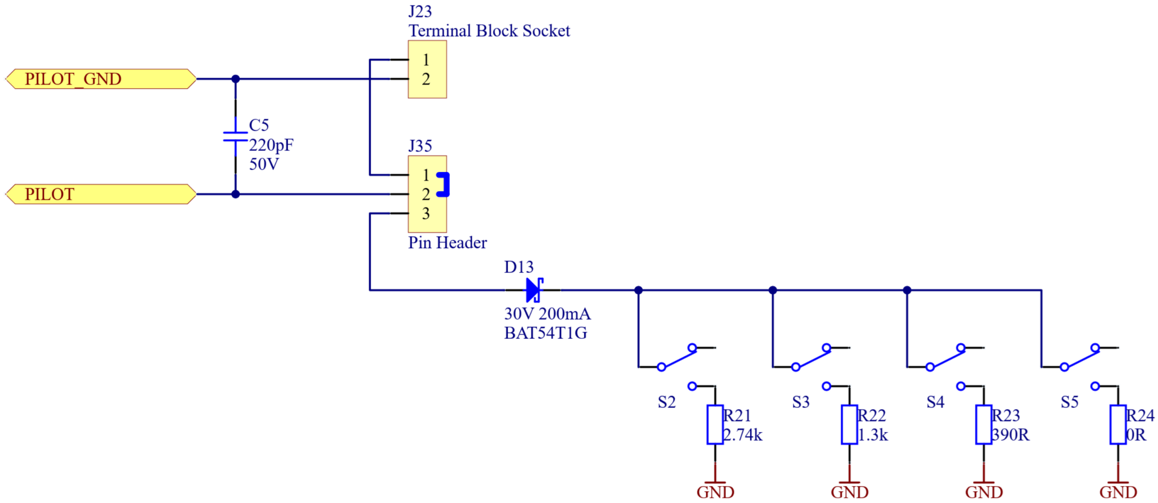


Fig. 14: Control Pilot circuit schematics

8.1.1 Input selection

The EvseSOM EVB™ supports two methods of CP operation:

- **Vehicle simulation using onboard switches** – integrated switches and resistor networks allow simulation of standard EV charging states without connecting a real vehicle.
- **External CP connection** – the CP signal can be connected externally through dedicated connectors for integration with external EV or EVSE equipment.

CP operation method should be selected with J35 header.

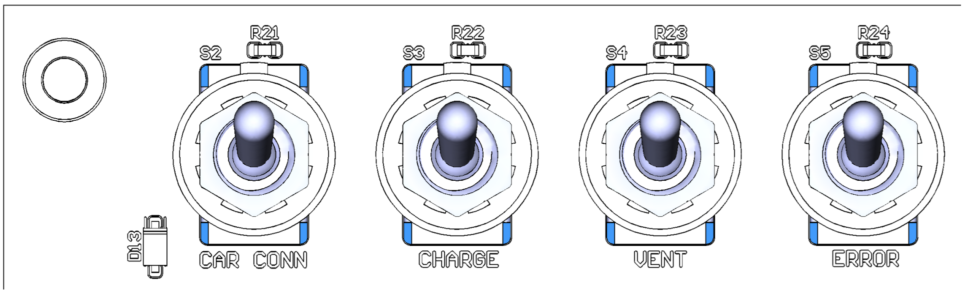
Tab. 4: J35 Pin Header Configuration Settings

Jumper Position	Mode	Description
1–2	External Terminal Block	Connects the PILOT signal to pin 1 of J23 (Terminal Block Socket). Use this setting to utilize the external connector.
2–3	Internal On-board Switches	Connects the PILOT signal to pin 3 of J35, routing it to the on-board switches. Use this setting to control the pilot circuit internally.

8.1.2 CP Simulation Switches

The EvseSOM EVB™ includes onboard switches S2–S5 that connect predefined resistor values between the CP line and ground. These resistor combinations emulate the electrical states defined by the IEC 61851-1 standard.

Fig. 15: Control Pilot connector and switches



The simulation states are summarized in Table 5.

Tab. 5: Control Pilot simulation states

IEC 61851-1 State	Switch	Resistance to GND	Description
A	ALL OFF	open	Vehicle not detected
B	S2	2.74 kΩ	Vehicle detected
C	S3	882 Ω	Charging
D	S4	270 Ω	Charging with ventilation required
E	S5	0 Ω	Fault or error condition

The states and their corresponding PWM states are shown in the figure 16.

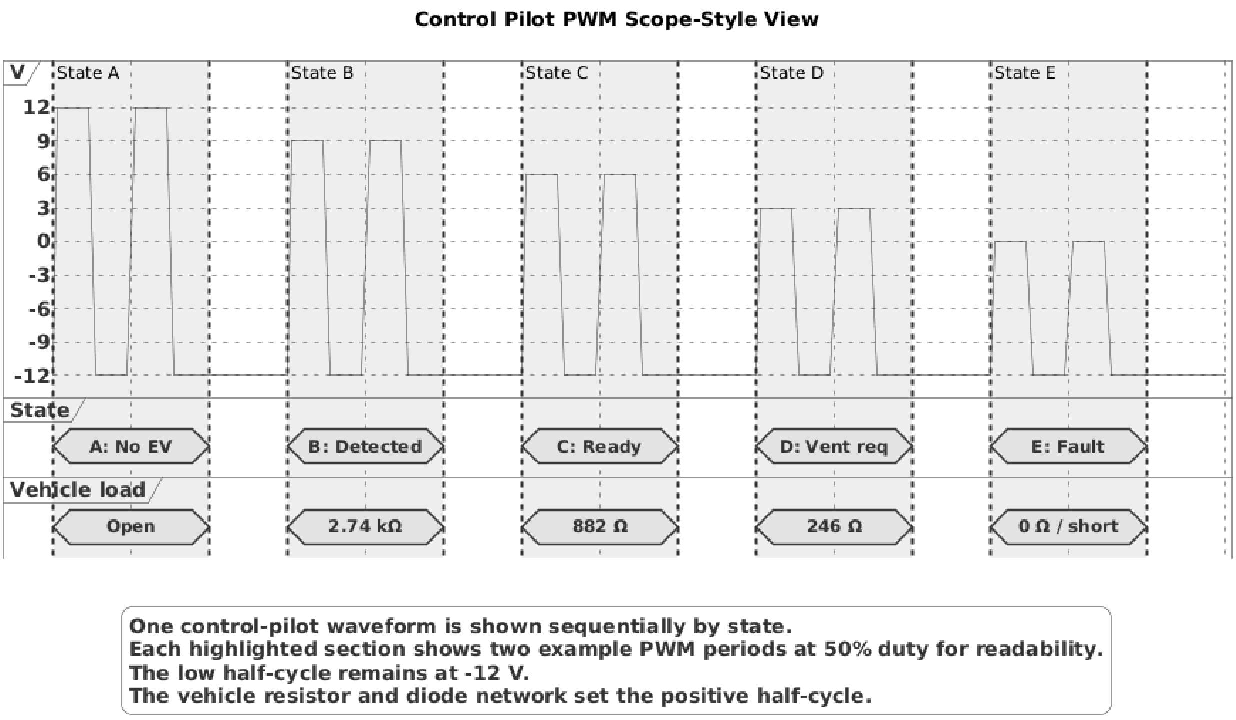


Fig. 16: Control Pilot PWM states

8.1.3 External CP Connection

The EvseSOM EVB™ also allows connection of an external Control Pilot signal through the dedicated connector interface:

- **PILOT** – CP signal line
- **PILOT_GND** – reference ground

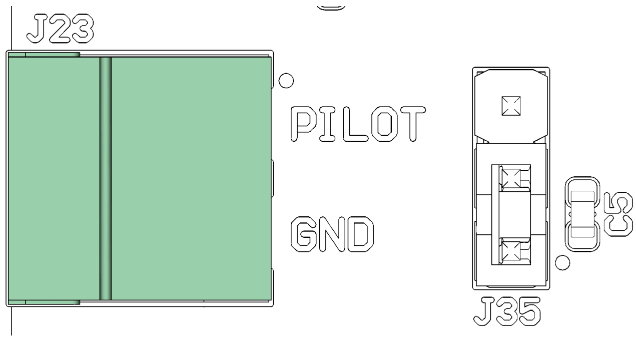


Fig. 17: Control Pilot connector

The input circuitry includes filtering component to improve signal integrity and robustness during external operation.

8.2 Proximity Pilot

The Proximity Pilot (PP), also known as Plug Present, is a signaling line used in AC electric vehicle charging systems to detect the presence of the charging cable plug and to communicate the maximum current-carrying capacity of the cable assembly. This mechanism prevents the vehicle from driving away while connected and ensures that the EVSE does not supply a current exceeding the physical limitations of the cable.

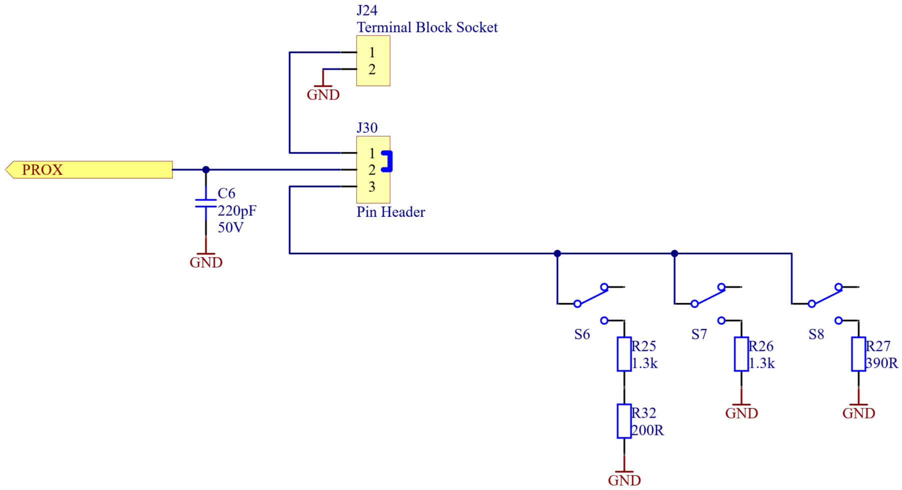


Fig. 18: Proximity schematics

The EvseSOM EVB™ provides a dedicated PP interface for simulation and evaluation of the proximity detection circuitry according to IEC 61851-1. The board supports two methods of PP operation, which can be selected via the J30 pin header:

- **Cable simulation using onboard switches** – integrated toggle switches and resistor networks allow simulation of standard cable current limits (12A, 20A, 32A) without connecting a physical cable.
- **External PP connection** – the PP signal can be routed externally through dedicated connectors to interface with a real EV charging plug or external measurement equipment.

The PP operation method must be selected using the J30 header configuration settings described in Table 6.

Tab. 6: J30 Pin Header Configuration Settings

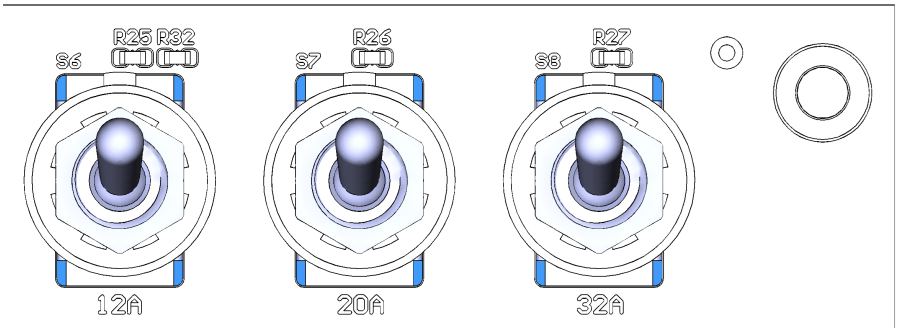
Jumper Position	Mode	Description
1–2	External Terminal Block	Connects the PROX signal to pin 1 of J24 (Terminal Block Socket). Use this setting to utilize the external connector.
2–3	Internal On-board Switches	Connects the PROX signal to pin 3 of J30, routing it to the on-board simulation switches.

8.2.1 PP Simulation Switches

The EvseSOM EVB™ includes onboard switches S6–S8 that connect predefined resistor combinations between the PROX line and GND. By toggling these switches, the user can emulate the exact resistance values required by the standard to signal the cable's maximum current capacity.

The relationship between the standard charging currents, active switch positions, and equivalent resistances to ground is summarized in Table 7.

Fig. 19: Proximity switches



Tab. 7: Proximity Pilot cable simulation states

Cable Capacity	Active Switch	Resistance to GND
12 A	None (Default)	1.5 kΩ
20 A	S7	696 Ω
32 A	S7 ‖ S8	250 Ω

8.2.2 External PP Connection

For advanced hardware-in-the-loop (HIL) testing, an external Proximity Pilot interface is available via the **J24 Terminal Block Socket**. This interface exposes:

- **PROX** – Proximity Pilot signal line
- **GND** – Signal reference ground

The input circuitry includes a filtering capacitor C6 connected to ground to suppress high-frequency noise and ensure clean edge transitions during plug detection sequences.

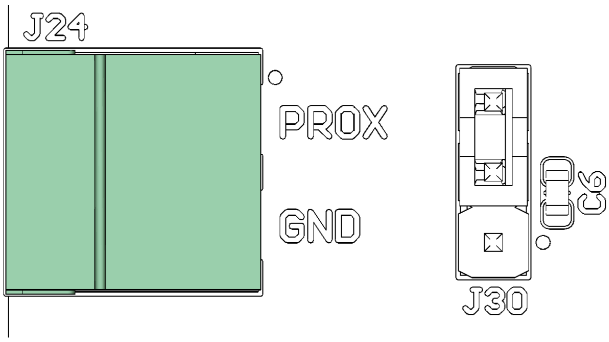


Fig. 20: Proximity connector

9 Mechanical Characteristics

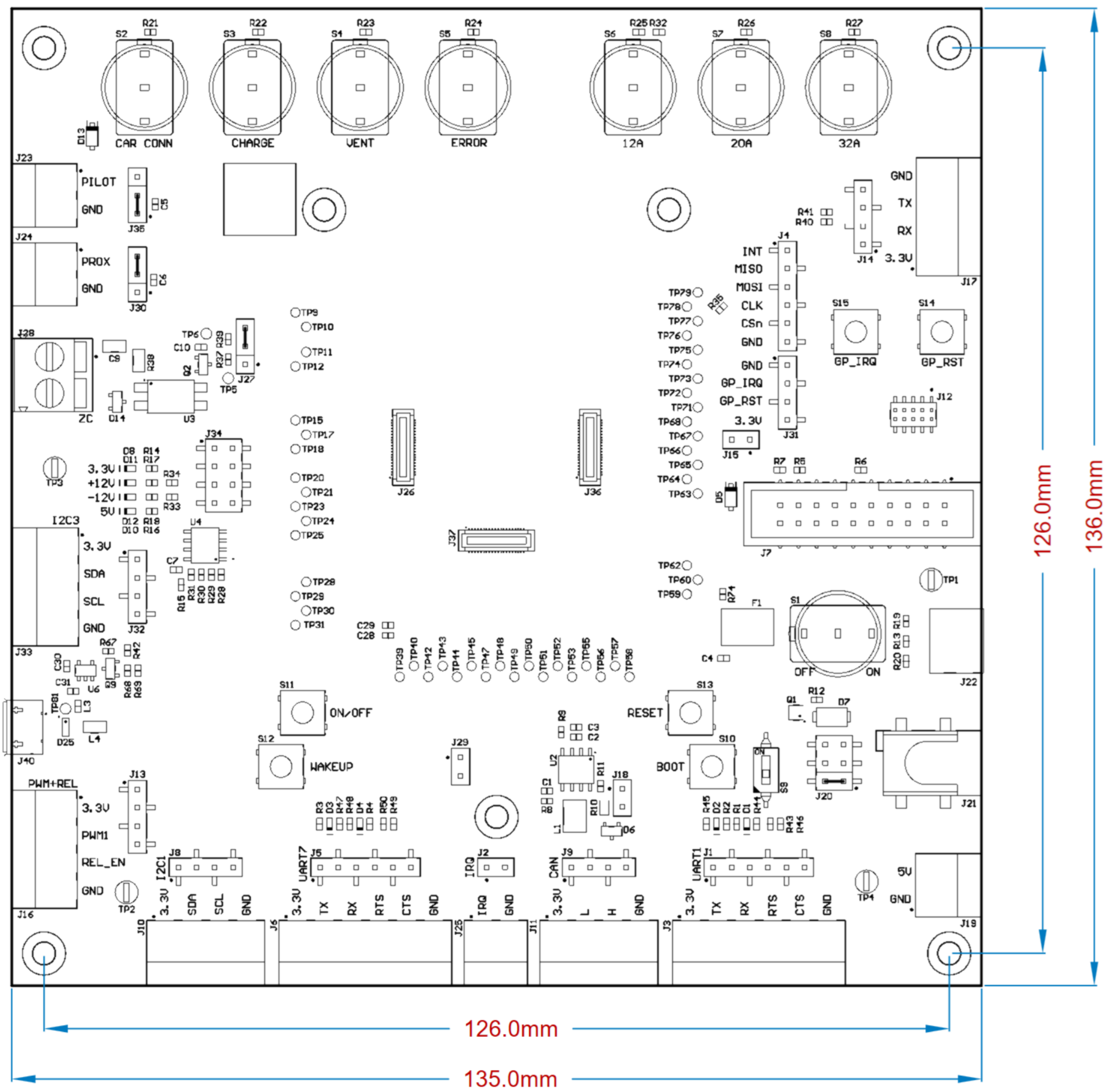


Fig. 21: Dimensions

Revision History

Revision	Date	Description
1.0	2026-08-05	Initial release.

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