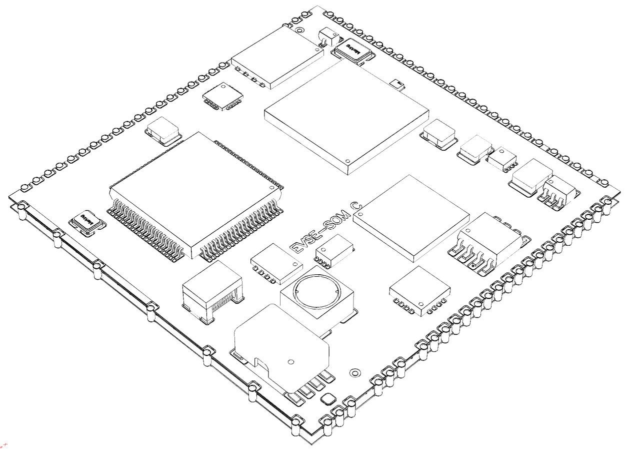
Grinn EvseSOM



1 Features

- Small size 42.5 x 43.5 x 5.25mm
- Operating temperature -40°C to 85°C
- Single power supply 4.5V to 5.5V
- Driven by NXP i.MX RT1061 processor and Lumissil IS31CG5317 communication transceiver
- Communication Frequency Band 2 to 30 MHz
- ISO 15118-2 / IEC 61851 / DIN 70121 compliant
- Communication with HOST processor over UART interface
- In-System Programming

2 Applications

- EV Charging Stations (EVSE)

3 Description

The Grinn EvseSOM™ is an advanced System on Module (SoM) designed to meet the performance and efficiency needs of eMobility applications supporting communication standards HomePlug Green Phy and ISO15118-2.

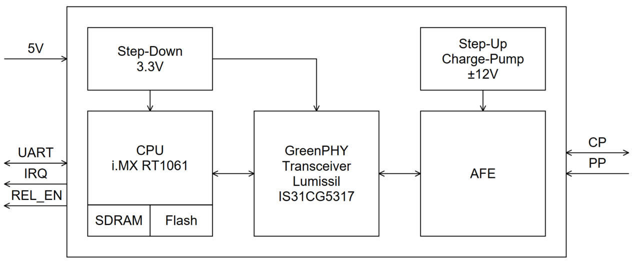


Fig. 1: Grinn EvseSOM™ block diagram

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4 Overview

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

It enables seamless communication between the Electric Vehicle Supply Equipment (EVSE) and the Electric Vehicle (EV) by supporting both High-Level Communication (HLC) and basic signaling.

The module is engineered to simplify the implementation of complex charging standards in both legacy and next-generation EVSE designs, acting as a bridge between the charging interface and the Host Application Processor.

4.1 Supported Standards and Communication

Grinn EvseSOM™ provides a complete software stack[1] to ensure full interoperability with global charging standards:

- **ISO 15118-2**: Full support for High-Level Communication (HLC).
- **ISO 15118-20**: Support for 2nd generation High-Level Communication (HLC)[2].
- **IEC 61851-1 (Mode 3)**: Native support for basic signaling via Pulse Width Modulation (PWM) on the Control Pilot (CP) line.

4.2 Host Interface and Integration

The module communicates with the Host CPU (Application Processor) via a robust UART interface, utilizing a Modbus-based register map. This architecture allows for:

- **Configuration & Control**: Complete parameterization of the charging process by the Host.
- **Telemetry**: Real-time monitoring of measured values and internal state machines.
- **Low-Latency Notifications**: A dedicated Interrupt (INT) line provides immediate notification to the Host regarding critical events, errors, or state changes (e.g., state transitions, fault detection), ensuring rapid system response without constant polling.

4.3 Analog Front-End (AFE) and Power Management

Grinn EvseSOM™ features a complete integrated Analog Front-End for direct interfacing with the EV:

- **Signal Generation & Monitoring**: The module generates the Control Pilot (CP) signal and monitors the Proximity Pilot (PP / Plug Present) resistance, managing the entire physical layer of the connection.
- **Integrated Power Conversion**: Built-in DC/DC converters generate all necessary internal voltage rails, including the ±12V supply required for compliant CP signaling.
- **Single-Supply Operation**: The module requires only a single +5V input, significantly simplifying the carrier board power tree and reducing overall BOM cost.

4.4 Firmware Management and Security

To ensure longevity and field-serviceability, EvseSOM includes a robust update mechanism:

- **In-System Programming (ISP)**: The Host CPU can perform remote firmware upgrades of the SOM while it is mounted in the finished product. This allows for seamless deployment of protocol updates and new features.
- **Secure Boot & Authentication**: The module implements a Secure Boot chain. Only firmware images cryptographically signed with a valid certificate are executed, protecting the system against unauthorized modifications, tampering, or "bricking" during the update process.

[1] Vehicle-to-Grid Communication Software Stack is implemented and maintained by Arrow Engineering Solutions Centre
[2] Availability is planned for the end of 2026 and subject to change.

5 Functional Description and Application

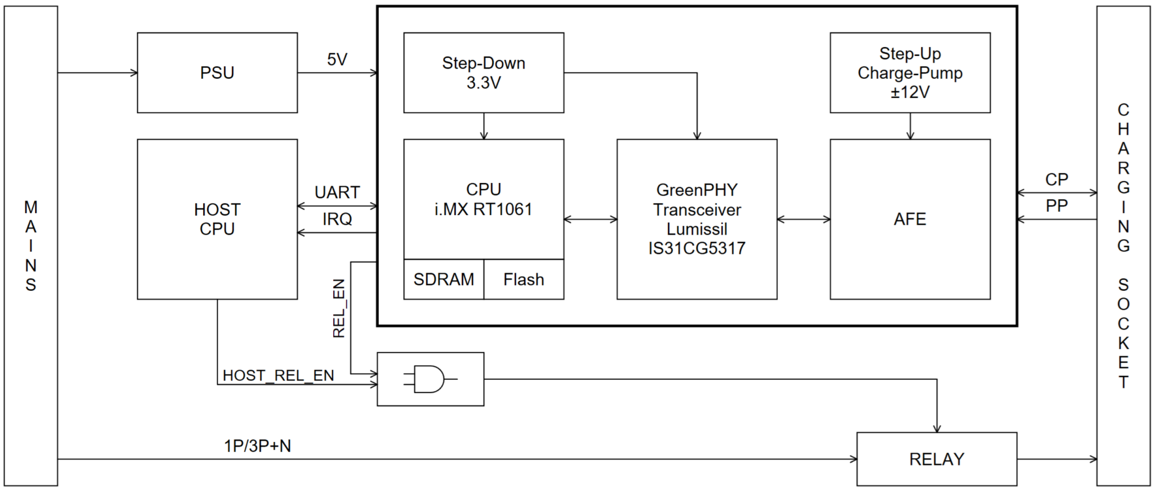

Fig. 2: Simplified application circuit

5.1 Power supply

Grinn EvseSOM™ operates efficiently with a single +5V power supply, simplifying power requirements. The 5V input is routed to a buck converter and a boost converter+negative charge pump (in tandem produce ±12V for the control pilot signal). The buck converter generates 3.3V for the CPU.

5.2 Host Interface

The Grinn EvseSOM™ is designed as a peripheral controller communicated via a high-speed asynchronous serial interface.

- **Physical Layer**: The module utilizes a standard UART interface with 3.3V CMOS/LVTTL logic levels. It is designed for direct connection to the UART peripheral of the Host Microcontroller (MCU) or Application Processor.
- **Asynchronous Signaling (IRQ)**: A dedicated Interrupt Request (IRQ) line is provided. This line allows the SOM to signal the Host immediately upon status changes (e.g., EV detection, state transitions, or fault conditions), eliminating the need for constant CPU-intensive polling over Modbus.
- **Protocol:** Data exchange is governed by a Modbus-based protocol, where the SOM acts as a Slave device. All charging parameters, diagnostic data, and configuration settings are mapped to specific registers. Detailed register maps are provided in the Grinn EvseSOM™ Communication Protocol Manual.

5.3 EV Interface Management

The module provides a complete physical and data link layer for the Electric Vehicle interface, strictly adhering to IEC 61851-1 and ISO 15118 requirements.

- **Autonomous Pilot Control**: The SOM independently manages the Control Pilot (CP) signal (PWM generation and feedback voltage sensing) and monitors the Proximity Pilot (PP / Plug Present) resistance to determine cable current capacity and connection state.
- **Automated Handshake**: The SOM handles the complex timing requirements of the ISO 15118/DIN 70121 handshake, offloading the real-time protocol execution from the Host.

5.4 Power Control and Safety Logic

To ensure system safety and flexibility, the Grinn EvseSOM™ follows a distributed control architecture:

- **SOM Responsibility**: The module manages the communication negotiation. It determines when the vehicle is ready for charging and validates the charging state.
- **Host Responsibility**: The Host CPU maintains ultimate control over the High-Voltage Power Path. It is responsible for driving the Power Relays / Contactors to energize or de-energize the mains output.
- **Shared Relay Control**: Relay activation is subject to a safety interlock between the SOM and the Host. The SOM provides a dedicated REL_EN signal, which must be logically ANDed with the Host authorization signal. Only when both conditions are met the main current path relays may be energized.

This design ensures compliance with timing and safety requirements defined by applicable standards, especially in scenarios where the EVSE must disconnect power from the EV within a defined response time.

6 Pin Definition

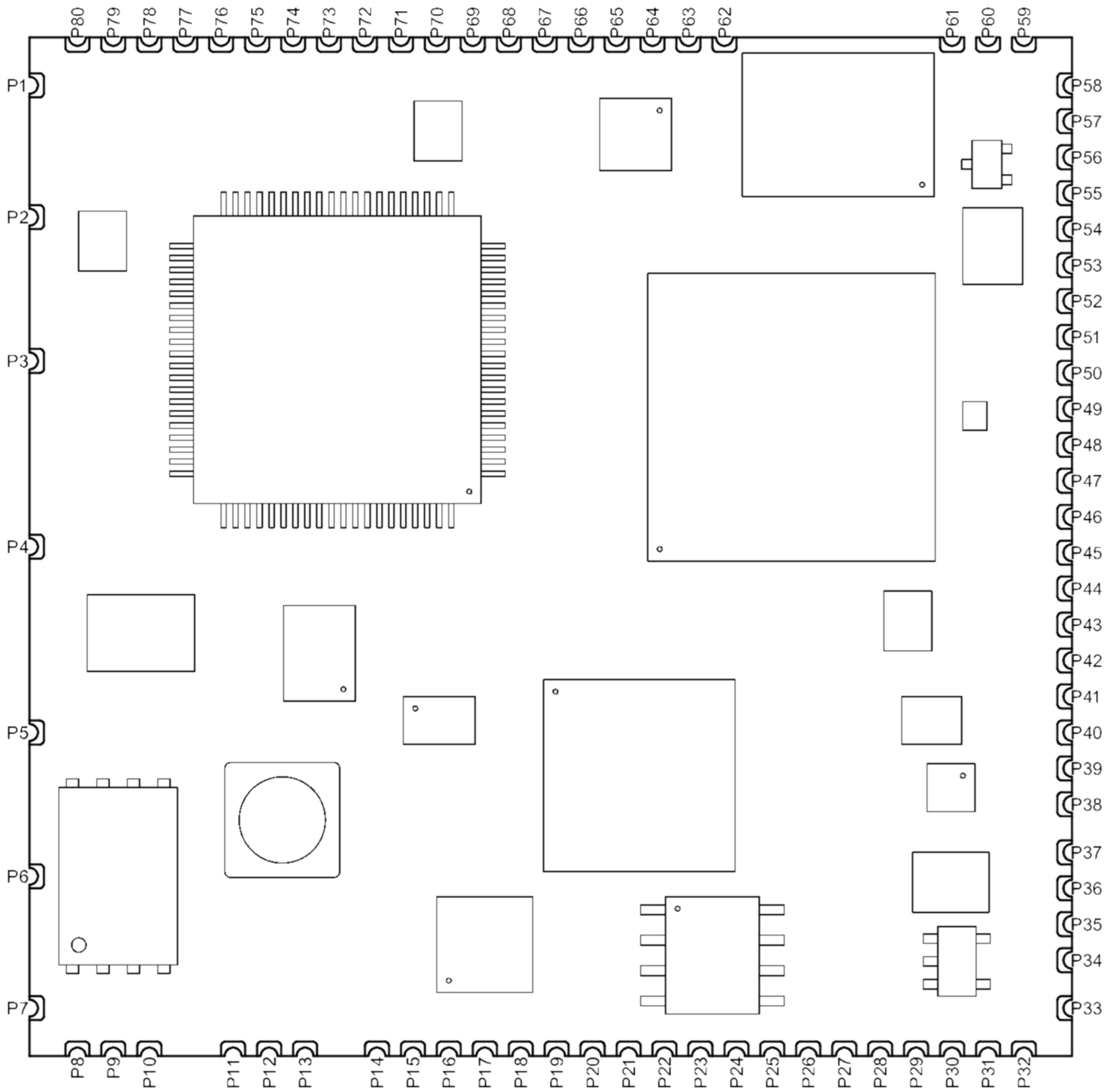

Fig. 3: Grinn EvseSOM™ pinout

6.1 Pad Description

Tab. 1: Grinn EvseSOM™ pad description

Pin Designator	Name	Electrical Type	Note
P1	GND	Power	
P2	GND	Power	
P3	GND	Power	
P4	GND	Power	
P5	GND	Power	
P6	GND	Power	
P7	GND	Power	
P8	GND	Power	
P9	PILOT	Input / Output	Connect to Charging socket CP
P10	PILOT_GND	Input	Connect to Charging socket PE
P11	PROX	Input	Connect to Charging socket PP
P12	RESERVED		Do not connect
P13	GND	Power	
P16	GND	Power	
P17	RESERVED		Do not connect
P18	RESERVED		Do not connect
P19	GND	Power	
P20	RESERVED		Do not connect
P21	RESERVED		Do not connect
P22	GND	Power	
P23	RESERVED		Do not connect
P24	RESERVED		Do not connect
P25	RESERVED		Do not connect
P26	RESERVED		Do not connect
P27	RESERVED		Do not connect
P28	RESERVED		Do not connect
P29	RESERVED		Do not connect
P30	RESERVED		Do not connect
P31	REL_EN	Output	Relay enable
P32	GND	Power	
P33	GND	Power	
P34	GND	Power	
P35	GND	Power	
P36	5V	Power input	
P37	5V	Power input	
P38	GND	Power	
P39	RESERVED		Do not connect
P40	RESERVED		Do not connect
P41	GND	Power	
P42	UART TX	Output	Host interface
P43	UART RX	Input	Host interface
P44	UART RTS	Output	Host interface (optional)[1]
P45	UART CTS	Input	Host interface (optional)[1]
P46	GND	Power	
P47	RESERVED		Do not connect
P48	RESERVED		Do not connect
P49	RESETn	Input (pull-up)	Active low
P50	RESERVED		Do not connect
P51	IRQ	Output	Host interface
P52	RESERVED		Do not connect
P53	RESERVED		Do not connect
P54	GND	Power	
P55	RESERVED		Do not connect
P56	RESERVED		Do not connect
P57	RESERVED		Do not connect
P58	RESERVED		Do not connect
P59	GND	Power	
P60	RESERVED		Do not connect
P61	GND	Power	
P63	RESERVED		Do not connect
P64	RESERVED		Do not connect
P65	RESERVED		Do not connect
P66	RESERVED		Do not connect
P67	RESERVED		Do not connect
P68	RESERVED		Do not connect
P69	GND	Power	
P70	GND	Power	
P71	RESERVED		Do not connect
P72	RESERVED		Do not connect
P73	RESERVED		Do not connect
P74	RESERVED		Do not connect
P75	RESERVED		Do not connect
P76	RESERVED		Do not connect
P77	RESERVED		Do not connect
P78	RESERVED		Do not connect
P79	RESERVED		Do not connect
P80	GND	Power	

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

7 Electrical Characteristics

Tab. 2: Operating conditions

Parameter	Min	Typ	Max	Unit
Power Supply	4.5	5.0	5.5	V
Current Consumption	140		225	mA
Power Consumption			1.5	W
Host Interface I/O Voltage	3.0	3.3	3.6	V

8 Environment Conditions

Tab. 3: Environmental conditions for device operation and storage.

Parameter	Value	Unit
Operating Temperature	-40 to 85	°C
Storage Temperature	-40 to 105	°C

9 Mechanical Characteristics

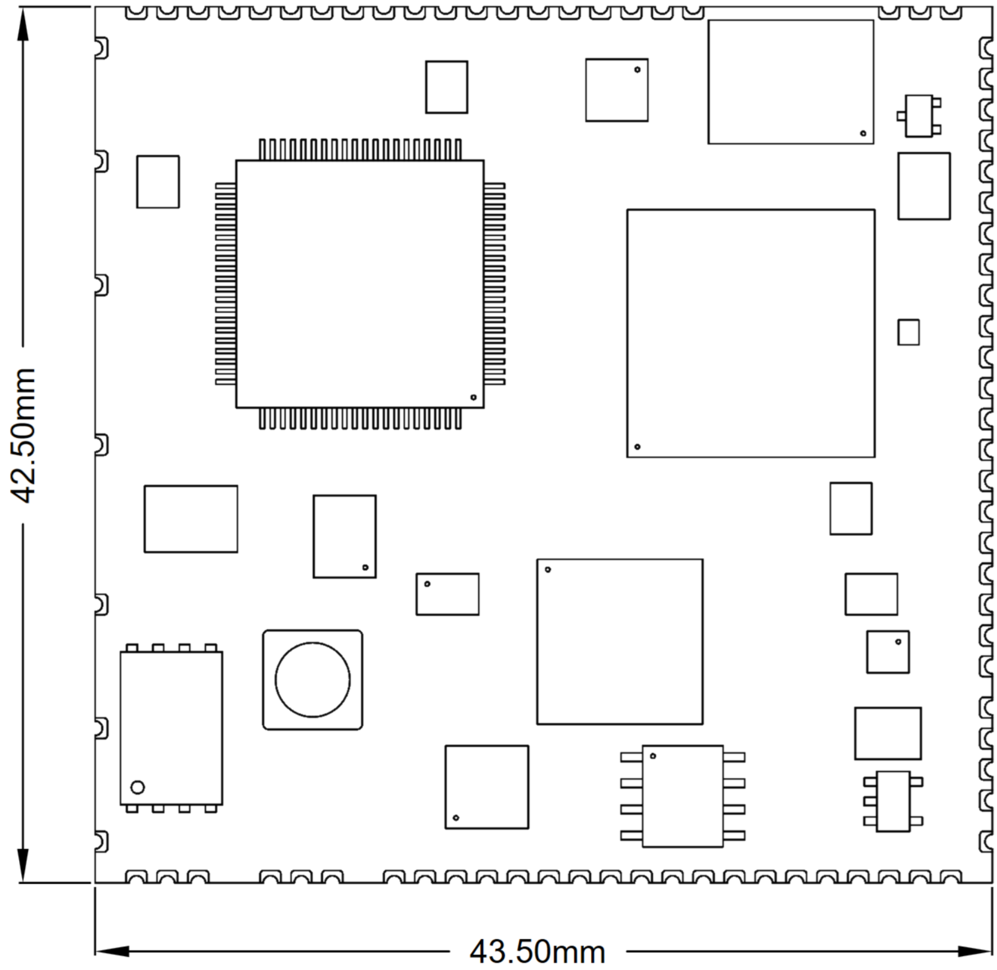

Fig. 4: Grinn EvseSOM™ dimensions

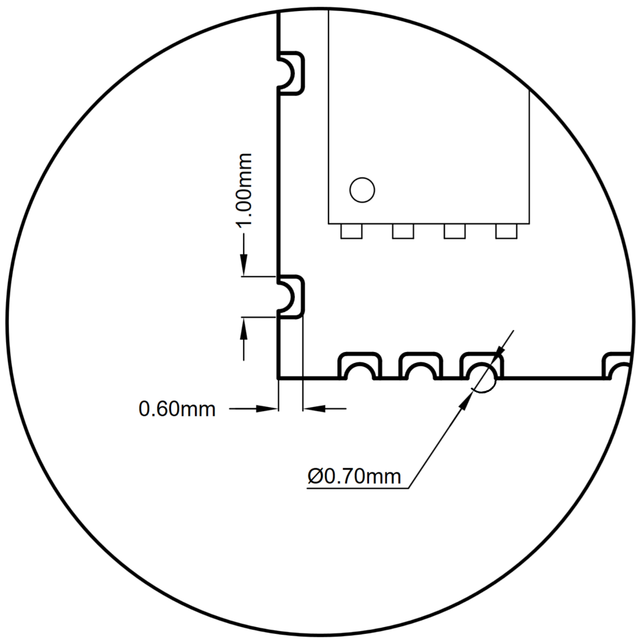

Fig. 5: Grinn EvseSOM™ pad dimensions

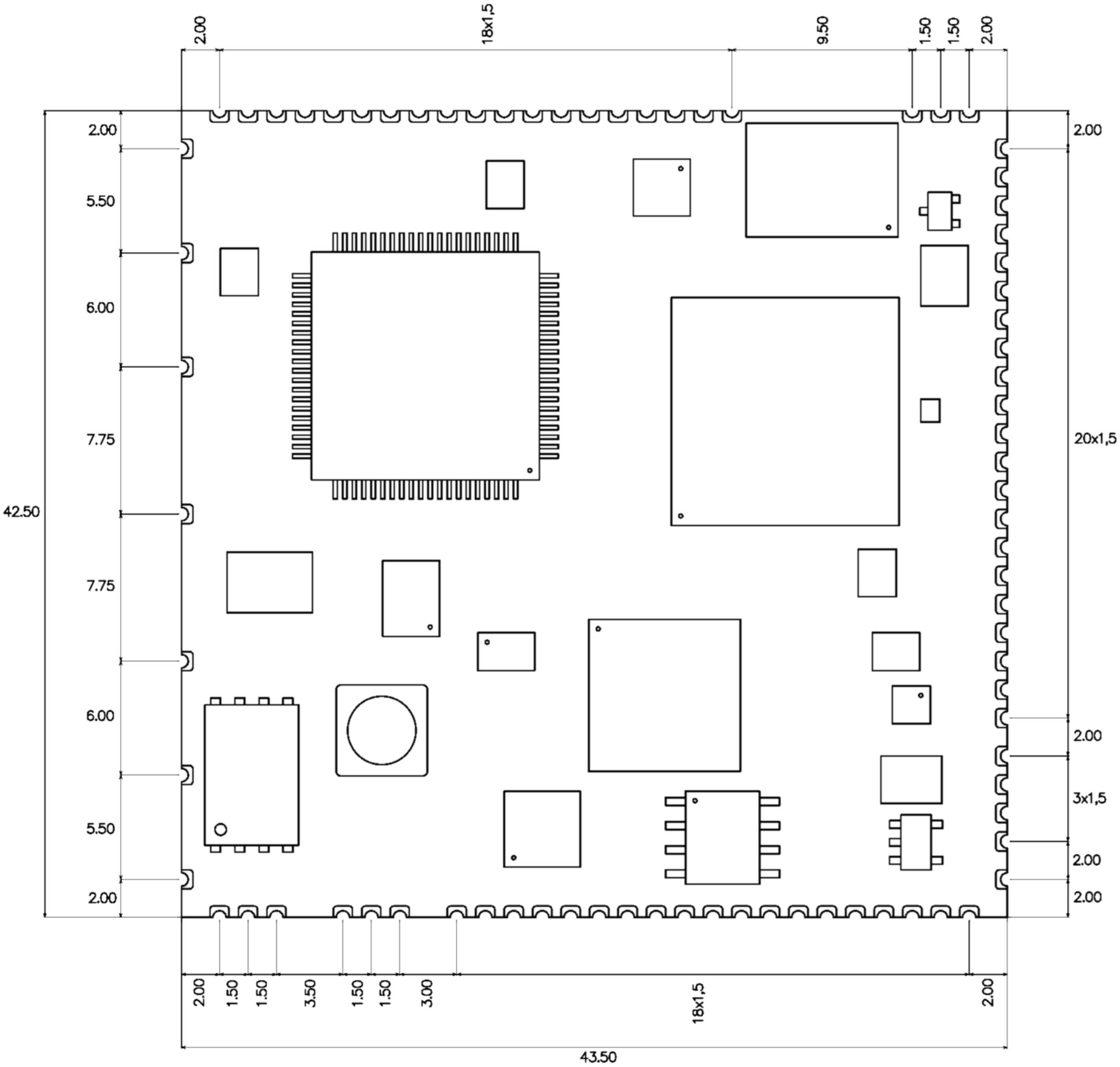

Fig. 6: Grinn EvseSOM™ pad positioning

Revision History

Revision	Date	Description
1.0	—	Initial release.
2.0	2026-04-13	Updated documentation to the Grinn EvseSOM™ rev. C0.
2.1	2026-05-18	Added support information for ISO 15118-20.

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