

AP-SE-B Core Board Specification

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V1.1

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1. Product Introduction

AP-SE-B is a PLC communication core board specifically designed for European/American standard AC EV chargers. It integrates stable and reliable PLC communication functions, while supporting (optional) PWM generation, CP, PD/PP signal detection and other SECC core functions. AP-SE-B provides communication interfaces such as UART, which can flexibly communicate and interact with the MCU of the AC main control board.

AP-SE-B core board adopts compact vertical pin header soldering technology, with dimensions of 50mm in length × 30mm in height (excluding pin height). The core board is integrated by inserting 2.0mm × 18-pin pin headers into the AC main control board baseboard.

AP-SE-B fully supports ISO15118-2 and ISO15118-20 standards, and can also support advanced functions such as PnC and V2G.



AP-SE-B Core Board Physical Diagram

1.1. Model Information

Table 1: Model Information

Model	Description	Package Dimensions
AP-SE-B	PLC Communication Core Board	50mm(L) × 10mm(W) × 30mm(H), 2.0mm pitch 18-pin

	single-row pin header
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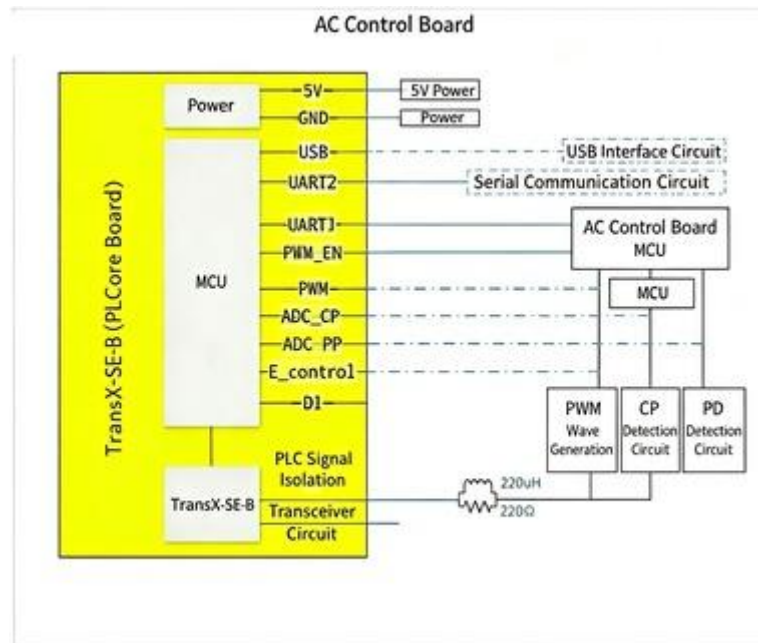
1.2. Key Functional Parameters

Table 2: Functional Parameters

Functional Parameter	Description
Charging Interface	Supports CCS1, CCS2, NACS
PLC Communication	Equipped with PLC communication transceiver circuit
PD/PP Detection (Optional)	PD/PP signal detection function (circuit on AC main control board)
CP Detection (Optional)	CP voltage level detection function (circuit on AC main control board)
PWM Generation (Optional)	PWM generation function (circuit on AC main control board)
E-State Control (Optional)	CP voltage meeting E-state function (circuit on AC main control board)
Supported Standards	ISO 15118-2 EIM, ISO 15118-2 PnC, ISO 15118-20: ISO 15118-20 EIM, ISO 15118-20 PnC, ISO 15118-20 BPT (V2X)
Communication Interfaces	UART × 2, USB × 1
Operating Temperature	-40°C ~ +85°C
Power Supply	5V (±0.2V): > 600mA
Logging and Upgrade	Supports OTA upgrade, log storage and log retrieval functions

2. Product Description

2.1. Interface Circuit Block Diagram between AP-SE-B and AC Main Control Board



Interface Circuit Block Diagram

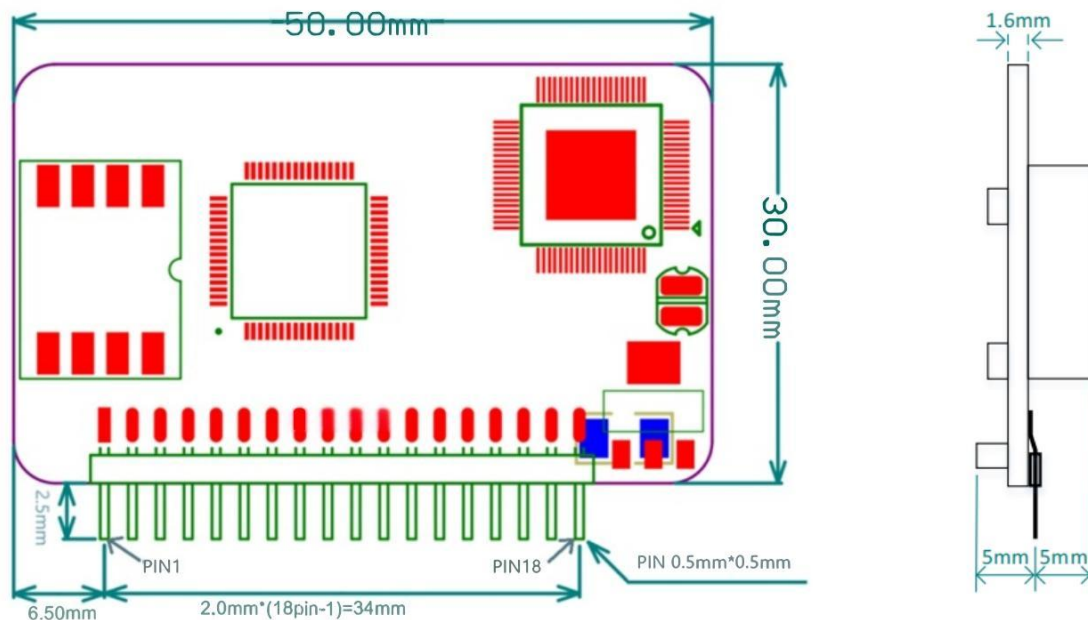
Interface Description:

1. **CP/PE Signals:** PLC signals (CP+PE) are directly routed from the AC main control board to the core board, where the core board performs modulation and demodulation communication for PLC signals. Between the core board CP signal and the CP signals of PWM generation and CP detection circuits, a parallel circuit of 220uH inductor and 220Ω resistor must be connected in series.
2. **UART1:** Serial communication interface between the core board and the AC main control board MCU for information and service interaction, TTL level.
3. **UART2:** External serial communication interface of the core board. The communication circuit needs to be arranged on the AC main control board to realize real-time data printing externally via serial port from the PLC core board.
4. **PWM, ADC_CP, ADC_PP (PD), E_Control:** PWM generation circuit, CP level detection circuit, PD detection circuit, and E-state control circuit are arranged on the AC main control board, and signals are connected to the AC main control board MCU for processing. It is optional for the AC main control board MCU not to process these four signals and leave them to the core board. In this case, these 4 signals need to be connected to the core board simultaneously, and the PWM_EN enable pin is used to select whether the main control board MCU or the core board handles processing. This function is optional.

5. **USB:** USB interface circuit is arranged on the AC main control board, which can be used for automatic upgrade by inserting a USB flash drive into the core board, and can also automatically export local logs via USB flash drive. This function is optional.
6. **DI:** Can be used to detect the CCS1 charging connector button and NACS charging connector SW signal. This function is optional.

2.2. Dimensions and Pin Interface Definition

The core board adopts 2.0mm × 18-pin single-row pin header vertical soldering connection method, with components mounted on both sides of the core board. The outline dimensions of the core board are shown in the figure below: (Dimensional tolerance for outline dimensions: $\pm 0.5\text{mm}$; Dimensional tolerance for pin length: $\pm 0.25\text{mm}$):



Core Board Outline Dimensions

In the figure above, PINs are numbered from pin1 to pin18 from left to right. The following table details the functional definition of each pin interface.

Table 3: Pin Description

Pin	Name	Type	Level	Description
1	PE	P	-	Connect to PE signal of AC main control board (paired with CP). PE of AC main board should be

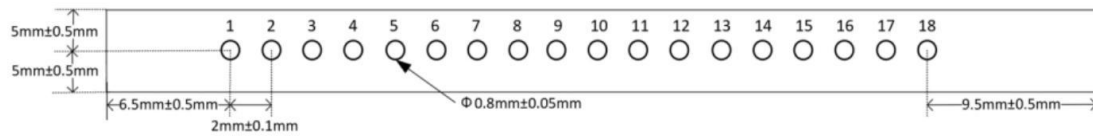
				connected to the PE grounding point of AC charging connector.
2	CP	I/O	-	Connect to PLC signal (CP signal) of AC main control board. CP signal of AC main control board should be connected to CP line of AC charging connector.
3	E_Control	O	3.3V	Optional. E-state control signal (High level: enable E-state, Low level: disable E-state). IEC 61850 standard requires CP state to have E-state.
4	DI_detected	I	3.3V	Optional. DI detection signal (e.g., CCS1 charging connector button, NACS charging connector SW signal).
5	UART1_TX	O	3.3V	Core board UART1 communication signal. Serial communication interface between core board and AC main control board MCU for information and service interaction, TTL level.
6	UART1_RX	I	3.3V	Core board UART1 communication signal. Serial communication interface between core board and AC main control board MCU for information and service interaction, TTL level.
7	GND	P	-	Reference ground for +5V power supply.
8	USB_DP	I/O	3.3V	Optional. USB interface signal. Interface circuit is arranged on AC main control board.
9	USB_DM	I/O	3.3V	Optional. USB interface signal. Interface circuit is arranged on AC main control board.

10	UART2_TX	O	3.3V	UART2 interface signal. Interface circuit is arranged on AC main control board.
11	UART2_RX	I	3.3V	UART2 interface signal. Interface circuit is arranged on AC main control board.
12	GND	P	-	Reference ground for +5V power supply.
13	PWM_EN	I	3.3V	Enable signal pin. Controlled by AC main control board MCU, or pulled up/down to fixed level via resistor. Low level: core board processes PWM, PD, PP, E-state control signals; High level: main control processes PWM, PD, PP, E-state control signals.
14	PWM	O	3.3V	Optional. Core board generates PWM waveform.
15	ADC_PP	I	3.3V	Optional. Core board detects PD signal.
16	ADC_CP	I	3.3V	Optional. Core board detects CP signal.
17	GND	P	-	Reference ground for +5V power supply.
18	+5V	P	-	Core board power supply +5V ($\pm 0.2V$), power supply current capability requirement > 600mA.

3. Pad Package Dimensions and Design Recommendations

3.1. Core Board Package Dimensions

Considering the pin pitch and dimensions of the core board, as well as the component heights on both sides of the core board, the recommended core board through-hole package dimensions for the AC main control board are as follows:

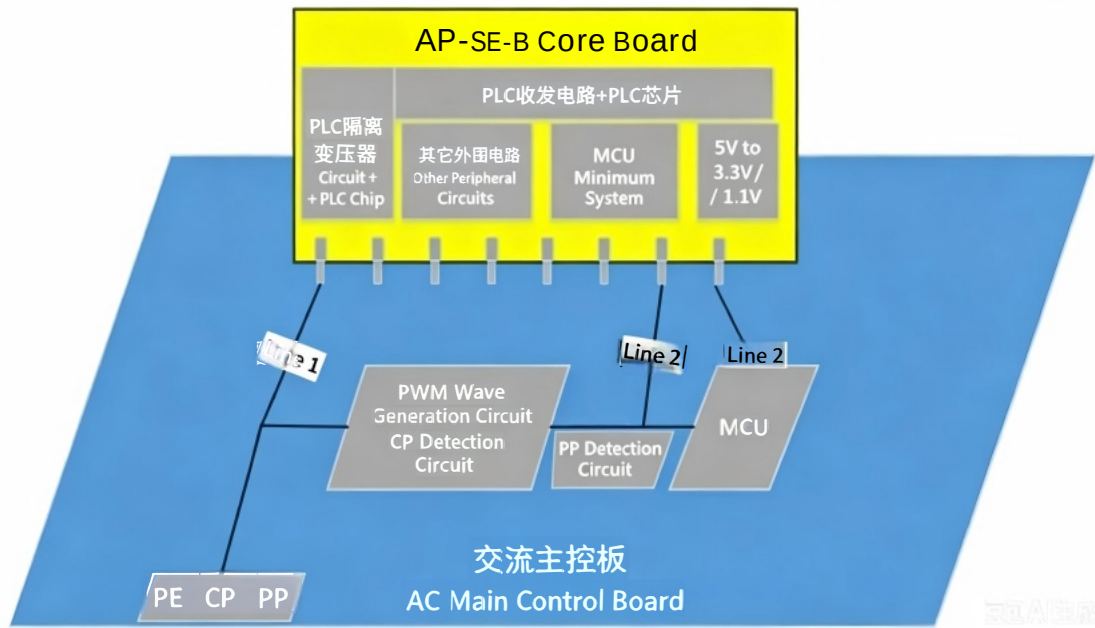


Recommended Pad Dimensions

3.2. Layout and Routing Design Recommendations for AC Main Control Board Integrating Core Board

As shown in the figure below, please pay attention to the following points during layout and routing design of AC main control board:

1. The routing (Trace 1) for CP/PE signals of the core board from the signal terminals of AC main control board to the CP/PE pins of core board should be as short as possible, and should avoid AC power lines and high-frequency circuits as much as possible to reduce high-frequency interference to PLC signals.
2. The communication lines between core board and AC main control board MCU should be as short as possible and protected by ground plane to improve anti-interference capability and ensure communication stability.
3. If CP, PP, PWM, E_control need to be connected to the core board, the routing (Trace 2) for these signals should be as short as possible and protected by ground plane to ensure signal stability and reduce interference introduction. PWM_EN signal must be set to the determined level according to mode selection.
4. For CP detection, PWM generation, PP detection, and E-state control circuits on AC main control board, please refer to *A P -SE-B Peripheral Recommended Circuits*.



Layout Routing Recommendations Diagram

4. Wave Soldering Processing Requirements for Core Board

- Pin contact material: Brass
- Pin contact plating: Gold plating
- Pin insulation material: Polyester (UL94V-0)
- Processing temperature: 230°C for 30-60 seconds; 260°C for 5 seconds

References

1. *TransX-SE-B Peripheral Recommended Circuits*
2. *EVSE-SECC Communication Protocol Specification*
3. *ZRN&JWT (EVSE-SECC) OTA Upgrade/Log Reading Protocol Specification*
4. *ZDUIP Nexus Host Computer Tool User Guide*
5. *Main Control Design Constraints Description*



Revision History

Date	Version	Description	Notes
2026.05.20	V1.0	Initial version	
2026.05.28	V1.1	Modified pin length dimension information, modified core board package dimension information, added soldering requirements and other related descriptions	