

# EVCharge SE

Data Sheet

## Document history

Revision 1.0	2013-10-10	Initial release
1.1	2013-11-06	Typo corrections

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## Introduction

Auronik offers leading-edge communication solutions according to DIN70121 and ISO15118. These solutions actually comprise the 3rd generation PLC and PWM communication hardware *EVCharge SE* and the corresponding communication software *ECommStack* both for DC and AC charging.

Along with these communication components comes the fully standard compliant electric vehicle communication simulator *DC.chargeSTRESSOR* with the capability to execute conformance tests according to DIN70121 against charging spots.

This documents contains the technical specification of the PLC and PWM communication board *EVCharge SE*.

### Application of EVCharge SE

The application purpose of the EVCharge SE board is to provide a hardware solution for charging spots with regards to DIN70121 and ISO15118 compliant signalling utilising GreenPhy power line communication (PLC) over pulse width modulation (PWM) technology (ISO layer 1 and 2). The boards are being integrated into charging spots and physically connected to the power electronics. To communicate with EVs it supports CP (control pilot) and PP (proximity pilot) signalling. Customer specific software interface adaptations take care for proper data exchange between power electronics and the EVCharge SE.

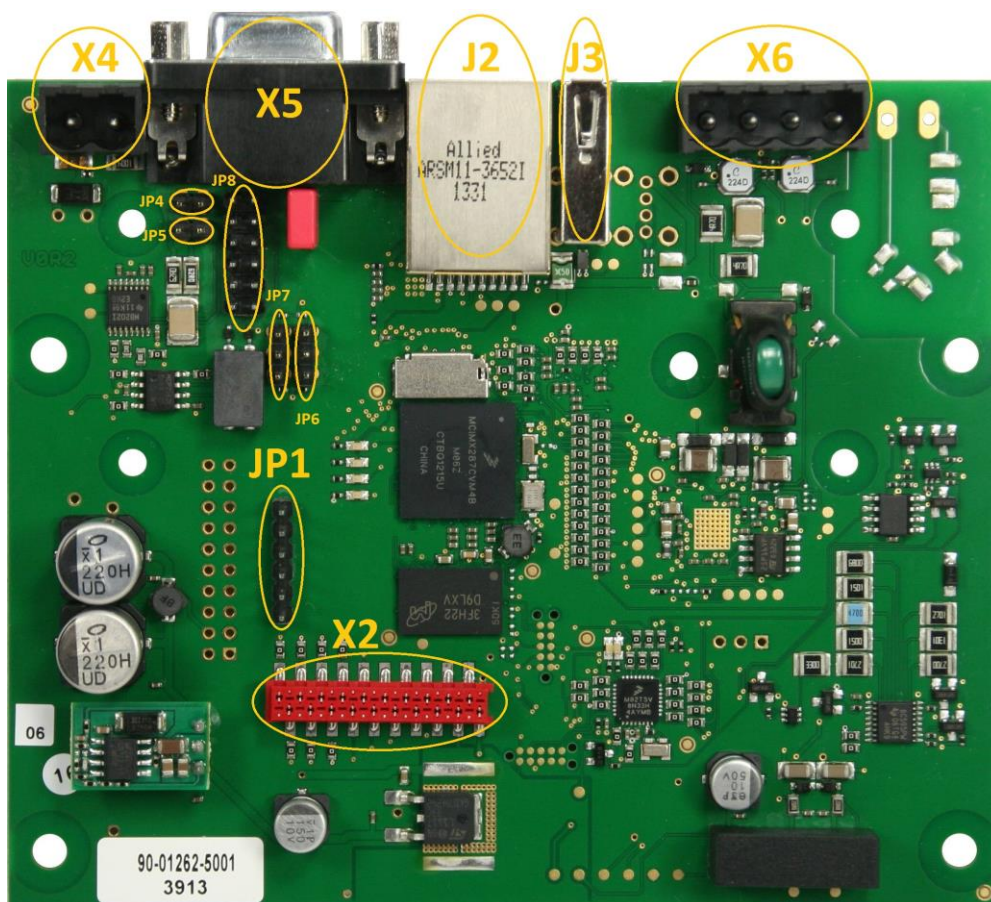


Fig 1: EVCharge SE

## EVCharge SE Features

- PLC communication via control pilot (CP) and protective earth (PE)
- PLC over PWM injection circuit
- applicable of AC and DC charging
- ISO 15118/ DIN 70121 compliant hardware design
- Standard compliant communication software ECommStack included
- Extension header for charging spot specific functions
- CE certification ready

## Technical data overview

- HomePlug GreenPhy PLC modem (QCA 7000)
- Embedded ARM processor (Freescale i.MX28)
- Storage: eMMC 4GB
- Network interface: Fast Ethernet
- Operating system: Debian jessie, Kernel 3.10
- RAM: 128 MB, Micron MT47H64M16 – 8 Meg x 16 x 8 banks
- climatic conditions: -40 to +85 °C, 95% rel. humidity (non condensing)
- Input voltage: 12V (+- 10%)
- Power consumption: Max. 4 W (2.6 W in idle mode) - No USB devices attached
- Dimensions: 100 x 120 x 20 mm
- Weight: 89 g
- RoHS: EVCharge SE is manufactured RoHS compliant

## Block diagram

The following chart depicts the functional blocks of EVCharge SE.

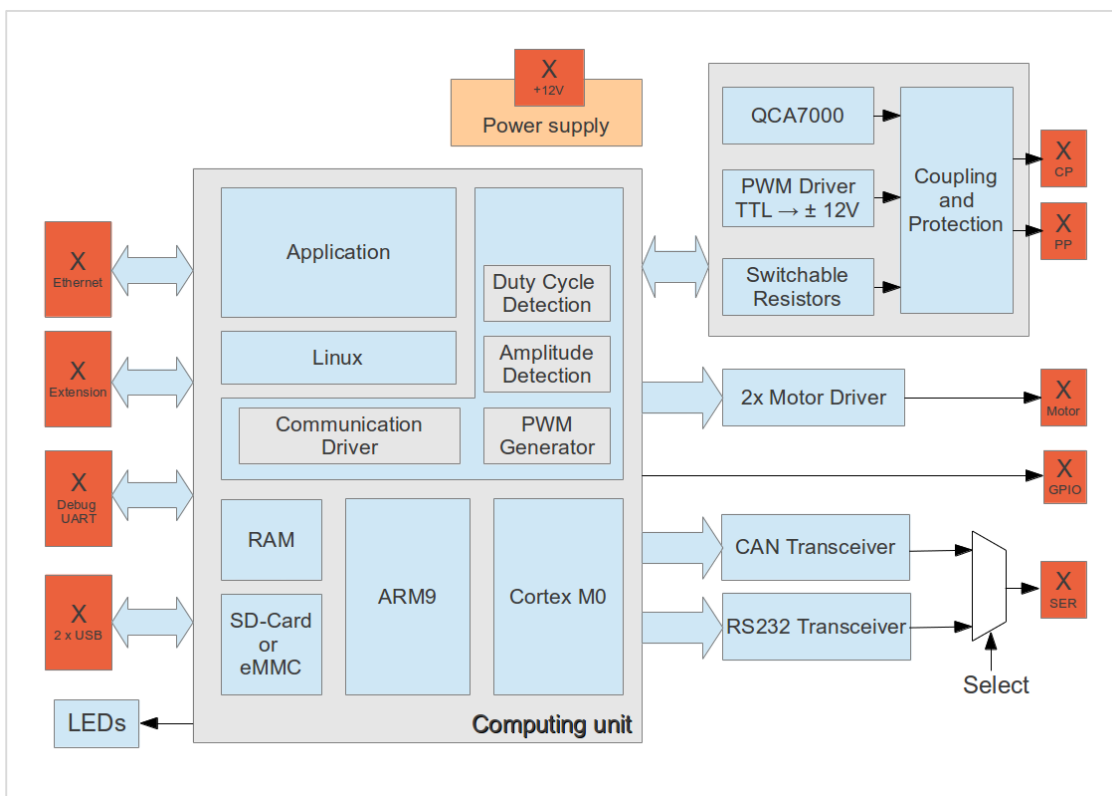


Fig 2: Functional blocks of EVCharge SE

## Mechanical dimensions

Subsequent figure shows the mechanical dimensions of EVCharge SE

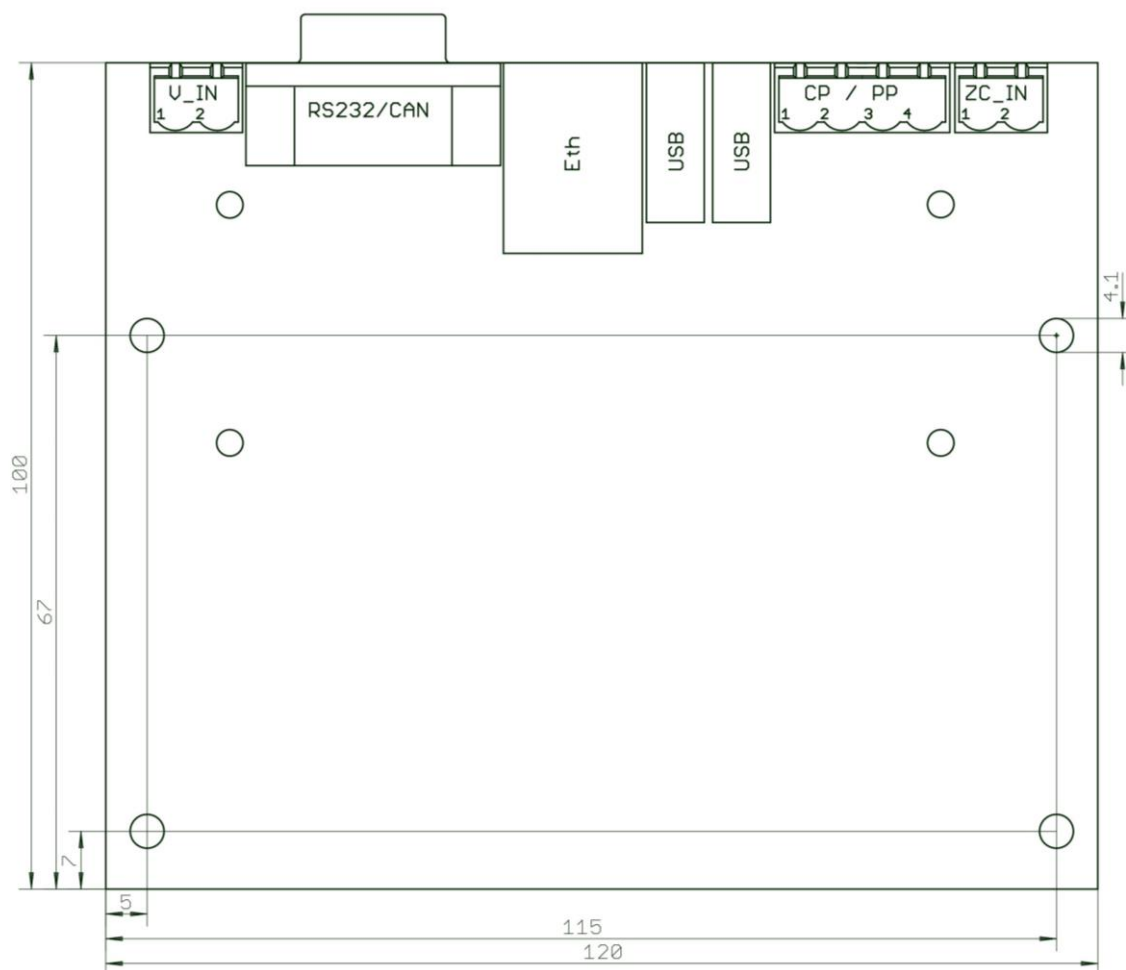


Fig. 3: Mechanical drawing of EVCharge SE including connectors



### LED3 (green)

The LED is connected to the i.MX28 pin P2 / LCD\_D08.

### LED4 (yellow)

The USS command indicator of the co-processor. Each time an USS command is received by the host and processed the LED flashes for a short time. If the co processor stays in bootloader (immediatly after reset for a few seconds) this LED is always on.

### LED5 (green)

The co-processor life sign. The LED blinks in a second interval showing the co-processor is working and alive. If the co-processor stays in boot loader (immediatly after reset for a few seconds) this LED is always off.

## Connectors

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The following picture of EVCharge SE gives an overview of all relevant connectors.

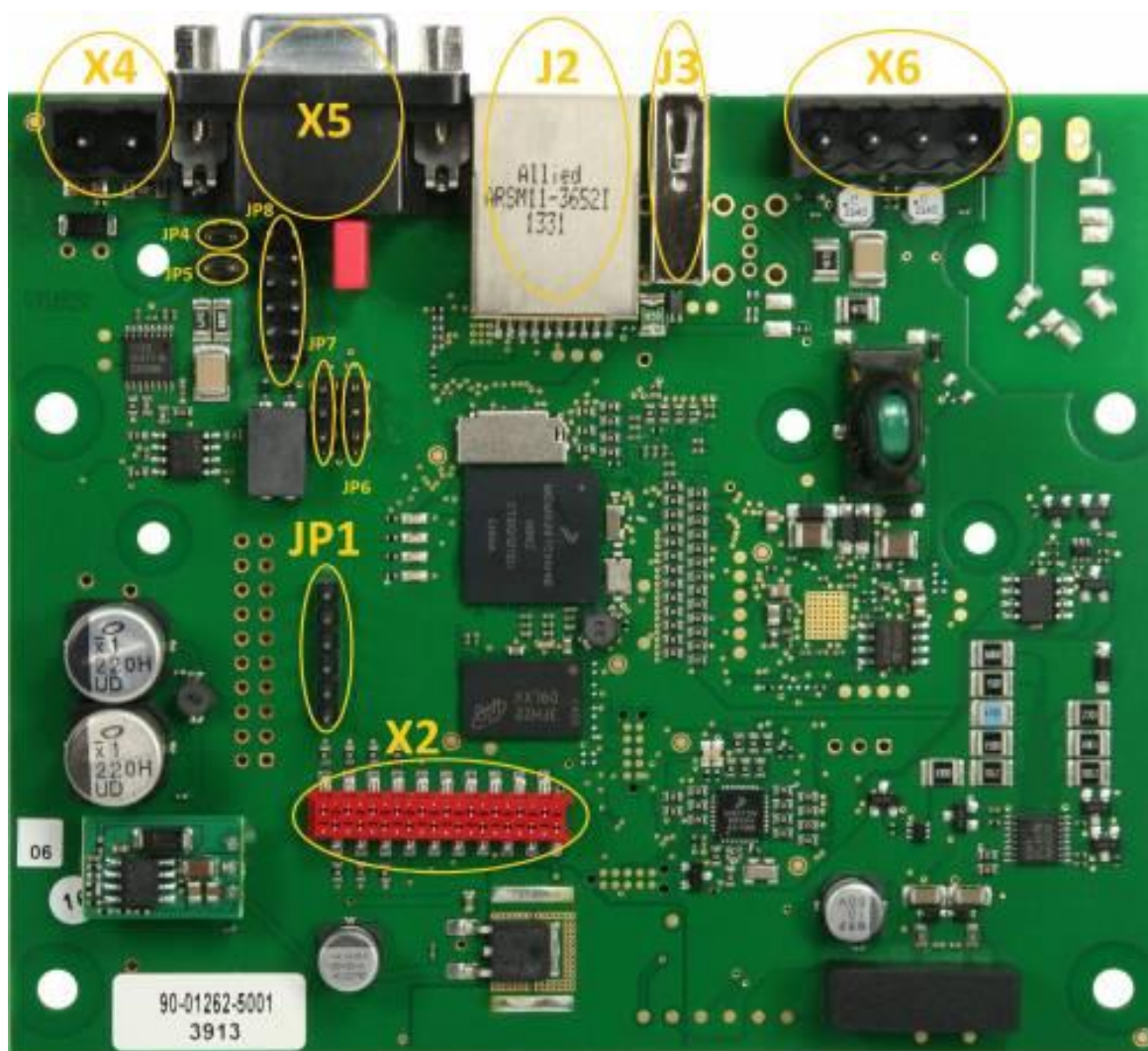


Fig. 5: EVSE board with marked connectors

## Debug UART (JP1)

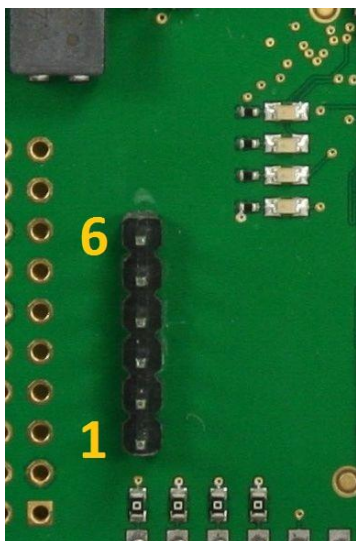


Fig. 6: Debug UART in detail

JP1 Pin	Name	i.MX28 Pin
1	GND	-
2	not connected	-
3	not connected	-
4	RX of i.MX28	K7 / PWM0
5	TX of i.MX28	L7 / PWM1
6	not connected	-

This pin-out is compatible with a variety of USB/RS232 adapters. Preferable you should use the FTDI cable "TTL-232R-3V3" or similar.

Use the following settings to connect to the debug UART:

Setting	Value
Baud Rate	115200
Data bits	8
Stop bits	1
Parity	None
Flow control	None



## Voltage Input (X4)

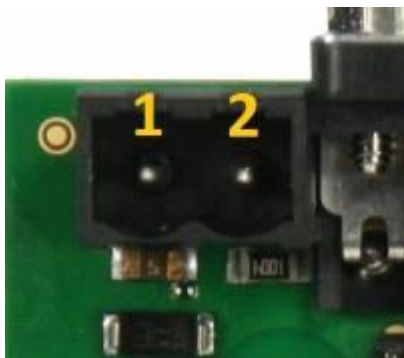


Fig. 7: Voltage input connector

X4 Pin	Name
1	+VIN
2	GND

## CAN / RS232 connector (X5)



Fig. 8: CAN/RS232 connector

This connector can be used to connect to the i.MX28 using CAN or RS232. Which one of these two interfaces is active is selected by Jumper JP8. To set the board to CAN mode set the jumpers as shown in figure 9. To set the board to RS232 mode set the jumpers as shown in figure 10.

### Pinout of X5 in both modes

X5 pin	Function in CAN Mode	Function in RS232 Mode
1	not connected	not connected
2	CAN_L	UART TX
3	GND	UART RX
4	not connected	not connected
5	not connected	GND
6	not connected	not connected
7	CAN_H	not connected
8	not connected	not connected
9	not connected	not connected

## CAN/RS232 selection (JP8)

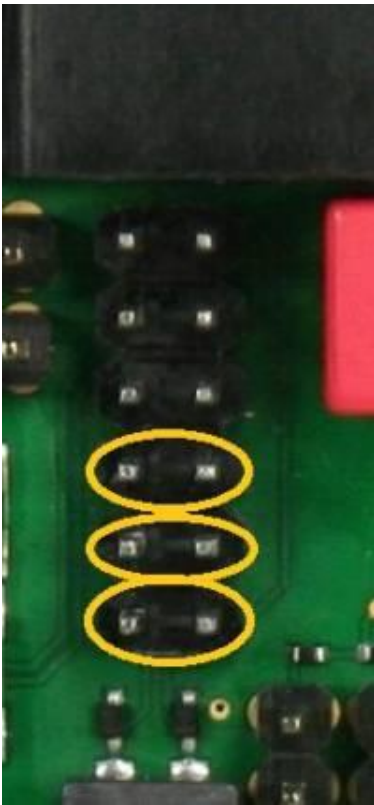


Figure 9. JP8 in CAN MODE

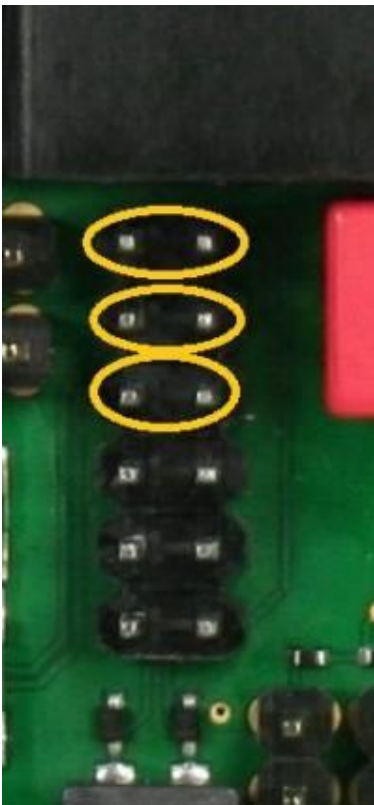


Fig. 10: JP8 in RS232 MODE

## CAN termination (JP4 and JP5)

The CAN termination resistor of 120  $\Omega$  can be enabled by setting **both** jumpers JP4 and JP5. Removing both jumpers disables the termination resistor.

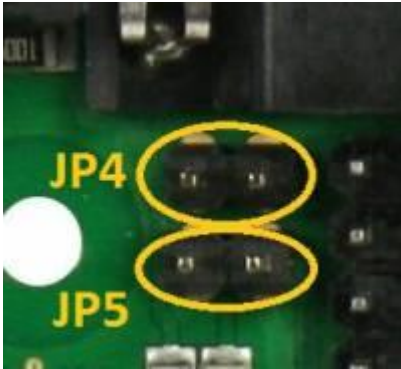


Fig. 11: CAN termination jumpers JP4 and JP5

## Ethernet (J2)



Fig. 12: Ethernet port

The Ethernet port supports 10/100 MBit/s and has embedded link and activity LED indicators.

## USB (J3)



Fig. 13: USB port

The EVSE acts as USB host at this port. Up to 500mA can be drawn from this port.

## Control and Proximity pilot connector (X6)



Fig. 14: Control and proximity pilot connector

The connector is used for connecting to EV or EVSE (depends on the mode).

X6 Pin	Function	Signal direction in EV mode	Signal direction in EVSE mode
1	Signal ground	-	-
2	Control pilot signal	Input	Output
3	Proximity pilot signal	Input	-
4	Signal ground	-	-

## Daughter board connector (X2)

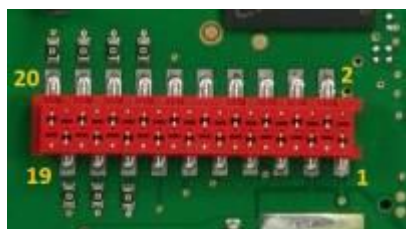


Fig. 11: Daughter board connector

Use this Micromatch header to connect additional GPIOs and/or motor driver (i.e. for plug locks).

X2 Pin	Function	Signal direction
1	-12V power supply (do not load with more than 1 mA)	Output
2	Signal ground	-
3	+3.3V power supply	Output
4	+12V power supply (do not load with more than 1 mA)	Output
5	+VIN power supply (fused from X4)	Output
6	+5V power supply	Output
7	Direction (phase) of lock motor 1	Output
8	Enable of lock motor 1	Output
9	Direction (phase) of lock motor 2	Output
10	Enable of lock motor 2	Output
11	End switch of motor 1 (0..3,3V)	Analogue input

12	End switch of motor 2 (0..3,3V)	Analogue input
13	Low active fault pin of motor driver	Input
14	IMX_HEARTBEAT from i.MX28: K4 / AUART1_TX	Output
15	DAUGHTER_GPIO_1 from i.MX28: R1 / LCD_D10	Input/Output
16	DAUGHTER_GPIO_0 from i.MX28: P1 / LCD_D97	Input/Output
17	DAUGHTER_GPIO_5 from i.MX28: N1 / LCD_DOTCLK	Input/Output
18	DAUGHTER_GPIO_4 from i.MX28: M1 / LCD_HSYNC	Input/Output
19	DAUGHTER_GPIO_3 from i.MX28: L1 / LCD_VSYNC	Input/Output
20	DAUGHTER_GPIO_2 from i.MX28: K1 / LCD_WR_RWN	Input/Output

### Boot selector jumpers for i.MX28 (JP6 and JP7)



Fig. 12: Jumper JP6 and JP7 for booting from eMMC

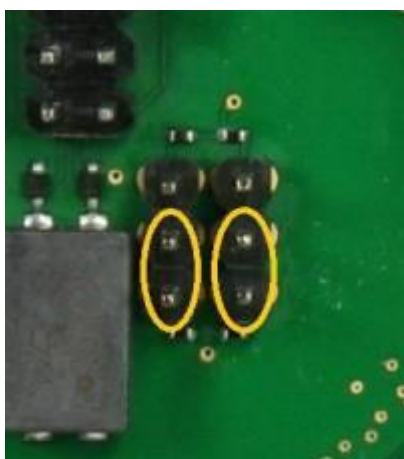


Fig. 13: Jumper JP6 and JP7 for booting from USB (J3)

The both jumper settings select the boot source for the i.MX28.

## Technical Data

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### Absolute Maximum Ratings

SYMBOL	PARAMETER	Min.	Max.	UNIT
VCC	Supply voltage	-0.03	+18.0 (1s)	V
V_CP	Control pilot voltage	-14.0	+14.0	V
V_PP	Proximity pilot voltage	-0.8	+9.0	V
TSTORE	Storage temperature	-40	+85	°C
RAH	Relative air humidity (non condensing)	0	85	%

### Operating conditions

SYMBOL	PARAMETER	Min.	Typ.	Max.	UNIT
VCC	Supply voltage	11.4	12	12.6	V
TCASE	Top of case temperature	-40	-	85	°C

## Auronik ECommStack

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The application purpose of ECommStack is to provide a software solution for charging spots with regards to DIN70121 and ISO15118 signalling (ISO layer 3 to 7). ECommStack runs on the **EVCharge SE** PLC board. Both products together realise all physical and protocol layers to comply with the DIN70121 and ISO15118 standard.

For a short time-to-market Auronik also develops customer specific software interfaces towards the charging spot's power electronics or performs adaptations to the already existing RS232 and CAN interfaces.

ECommStack common features:

- ISO 15118/ DIN 70121 compliant communication
- Allows for AC and DC charging
- Support for value added services (VAS)
- Support for external identification means (EIM)
- OS independent (Qt based)
- CAN and RS232 interface to power electronics
- Integrated TLS 1.2 security
- Implemented Protocols: IPv6, NDP, TCP, SDP, V2GTP
- Own V2G implementation as a stable alternative to OpenV2G
- Customer specific interface adaptations on request