WHITE beet Module - Product Brief

(Coming soon - expected for Q4-2020)

Product Overview

WHITE beet module is intended to add full ISO 15118 functionality to any existing AC-Wallbox or AC charging station or provide this functionality to pure DC Charging Stations or to existing CCS - Combinded Charging Systems (CCS) to bring down system cost.

It provids the necessary hardware to support ISO 15118-3 HomePlug Green Phy Powerline Communication over Control Pilot wire and Protectiv Earth, includes an STM32 Micro-Controller for executing the ISO 15118 / DIN 70121 / SAE J2847/2 Software Stack on it and will act as interface converter between it´s SPI- / Ethernet- / USB- / CAN- / UART- interfaces and the PLC side.

In addition the module will provide IEC 61851-1 / SAE J1772 PWM generation and detection and will be available for the Electro Vehicle Charging Station side as well as for the Electro Vehicle onboard side.

The module will come in three different software configurations:

- SLAC/Bridging Mode as closed system
- Embedded ISO15118 Mode as a closed system
- SDK Open Mode - no embedded firmware

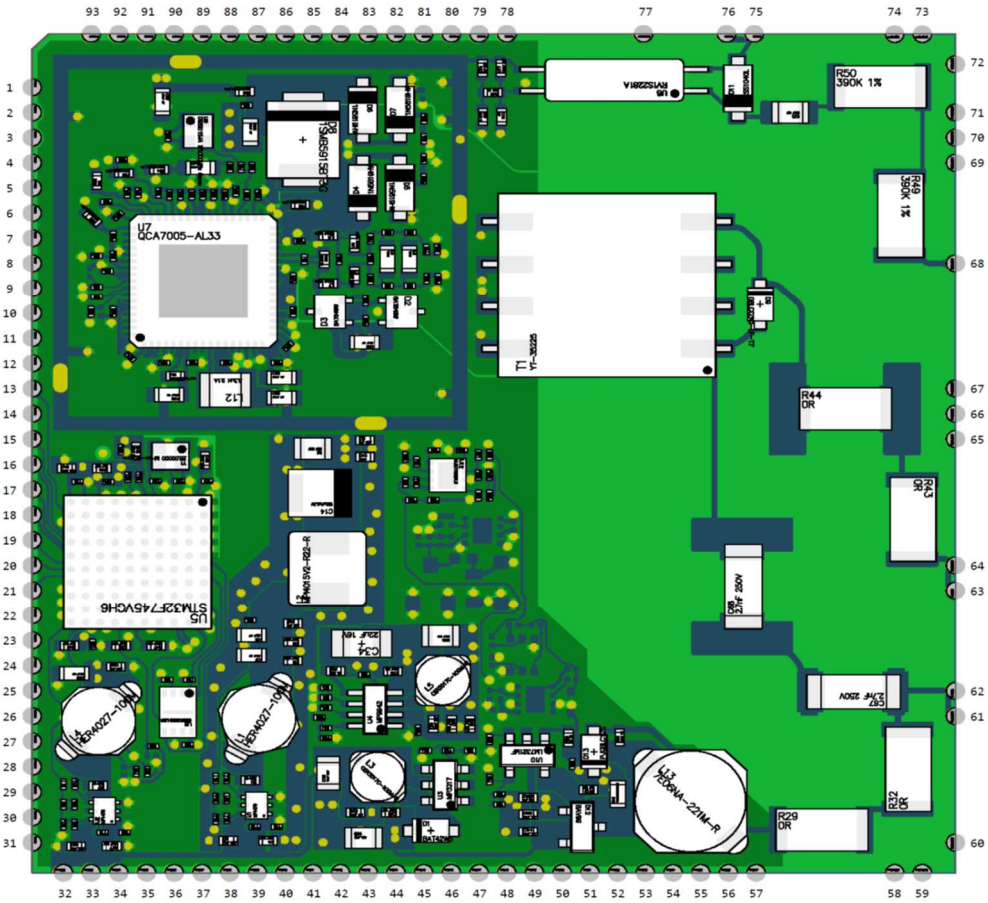
Soon it will provide Backbone Uplink communication support based on OCCP 1.6 and 2.0.

WHITE beet module is based on QCA7005 and together with it´s TCXO oscillator it will provide operation temperature up to 105°C.

Solution Highlights & Specifications

- available for the EVSE side and PEV side as well as for Home Controll /Smart Grid applications
- based on Qualcomm QCA7005-AL33 HomePlug Green Phy Chip
- based on STM32F745VGH6 Micro-Controller with 1 Mbyte internal Flash
- 4 MByte external NOR Flash Memory (2 MByte for user applications)
- SPI- / Ethernet- / USB- / CAN- / UART- interface towards the host controller
- mains (110V/230V) Zero Cross detection and digital input for ZC detection available on EVSE and Home Controll modules

- IEC 61851-1 / SAE J1772 PWM generation and detection for EVSE and PEV side
- optimized low noise DC/DC power supply for QCA7005
- very low noise floor implementation on PLC side providing a maximum of SNR for communication
- optimized PLC line coupling and overvoltage protection curcuitry to provide maximum SNR
- Operation temperature -40°C to +105°C board temperature / -40°C to +85°C ambient
- TCXO oscillator
- half via pinout in order to allow optical inspection of the soldering of the module and higher mechanical stability for rough environments like onboard of heavy duty machinery
- noise sensitive areas of the module shielded
- separated dual, low ripple 3.3V DC/DC power supply for QCA7005 and STM32
- +/-12V DC/DC power supply for IEC 61851-1 / SAE J1772 PWM generation and detection
- varaity of interfaces of STM32 available for user applications
- Green Phy Firmware options by boot-straps for FW v 1.1.0-02 and latest Fw (currently FW v 1.2.5)
- Boot-strap options for EN55022 / EN50561 EMC conformity for eMobility / Home Control Applications
- JTAG Interface for debugging
- 50mm x 50mm SMD package



WHITE beet E Engineering Sample (without shielding)

WHITE beet P Engineering Sample (without shielding)

WHITE beet H Engineering Sample (without shielding)

Software Options

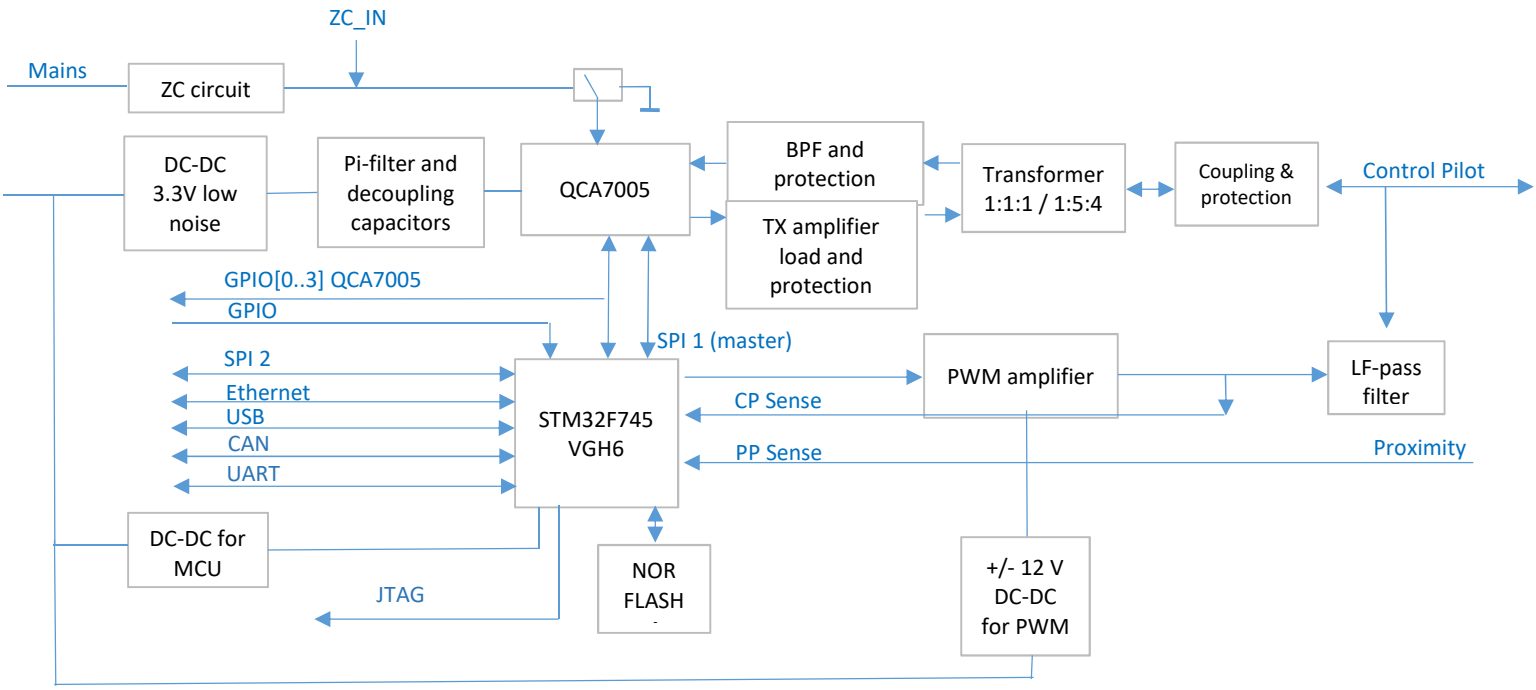
Option 1 - E-mobility (transparent/SLAC)
Allows MAC Frame bridging between CAN, SPI, USB, Ethernet and PLC as well as processing the full SLAC mechanism. Selection between these two modes (transparent or SLAC) will be done via boot-straping using micro switch.
System will be closed so the customer cannot add any own application software

Option 2 - E-mobility (ISO 15118 / DIN 70121 / SAE J2847/2 - Software Stack supporting V2G EMI (Vehicle to Grid, External Identification Means), PnC (Plug & Charge), BPT (Bipolar Power Transfere)
It includes ISO 15118-2 EMI and DIN 70121 / SAE J2847/2 Software stack as well as all necessary network protocols and services to offer a Host-MCU or a Host-MPU the full ISO 15118 communication stack via a well-documented plain Message-API.
ISO 15118 stack will as well in the future include Plug&Charge (PnC) and TLS
Host controller will be connected using CAN, SPI, USB or Ethernet interface.
OCCP 1.6 and 2.0 planned for the near future
System will be closed so the customer cannot add any own application software

Option 3 - SDK Open Mode - no embedded firmware
Option 3 - also named “open” will come with an SDK which allows developers to integrate their own applications into the module‘s STM32 MCU.
Please note that non of the software provided under Options 1 or 2 nor interface support software are included in the “open” version. But they could be made available directly from our Software partner on request. They would be subject to license fees to be agreed with our Software partner. This software features include - but not limited to - QCA700x SPI driver, SLAC (to offload a Linux host system from real-time critical timer activity), ISO 15118-2, DIN 70121, PnC, SAE J2847/2 (future option), ISO 15118-20 -BPT (future option), TCP/IPv6, TLS, OCPP Communication stacks (future option).

Option 4 - Home control/ smart grid
tunnel USB, Ethernet, SPI, CAN etc. communication over long distance over any kind of wire or transmission channel including but not limited to mains-230 V AC, DC powered lines, dead wires, twisted pair, Bell wires, CATx cables, Coax cables, etc.
The controller on the module will work in transparent mode and provide USB/Ethernet/SPI/CAN communication bridging to powerline. It will be available with EN 55022 and EN 50561 configuration settings, selected by boot-straping. Selection between these two modes (EN 55022 / EN 50561) will be done using micro switches

System Architecture



Variants and ordering numbers

WHITE beet module versions		**Software Option**	**CDC part no.**
WHITE-BEET-ES (EVSE) SLAC/Bridging	EVSE side	transparent/SLAC	#292206
WHITE-BEET-EI (EVSE) Embedded ISO15118	EVSE side	V2G + PnC Sw Stack	#292207
WHITE-BEET-EO (EVSE) SDK Open - no embedded firmware	EVSE side	SDK / open	#292208
WHITE-BEET-PS (PEV) SLAC/Bridging	PEV side	transparent/SLAC	#292210
WHITE-BEET-PI (PEV) Embedded ISO15118	PEV side	V2G + PnC Sw Stack	#295426
WHITE-BEET-PO (PEV) SDK Open - no embedded firmware	PEV side	SDK / open	#295427
WHITE-BEET-H (Home Control)	Home Control	transparent only	#292209

WHITE beet Module Pin-out (usable in SDK Open Mode only)

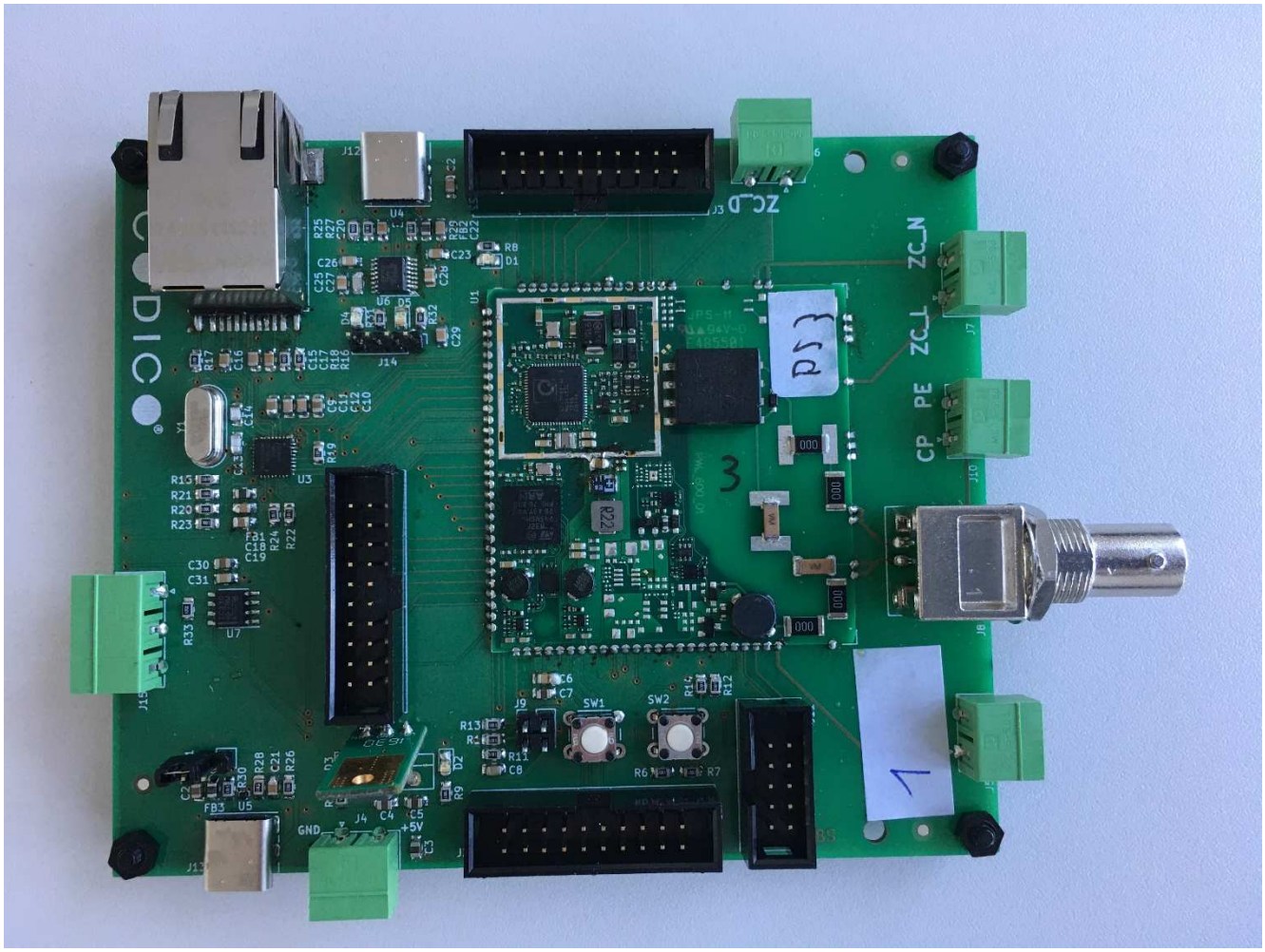
WHITE beet		STM32F745	
Pin number	Pin name	Pin address	Pin name
1	GND		
2	ETH_MDC	F2	PC1
3	ETH_MDIO	J2	PA2
4	ETH_RXD0	G4	PC4
5	ETH_REF_CLK	H2	PA1
6	ETH_RXD1	H4	PC5
7	ETH_CRS_DV	K3	PA7
8	ETH_TXD1	J8	PB13
9	ETH_TX_EN	K7	PB11
10	ETH_TXD0	K8	PB12
11	GND		
12	ETH_RSTN	J3	PA6
13	ADC_IN3	K2	PA3
14	PE7	H5	PE7
15	PB0	J4	PB0
16	PB1	K4	PB1
17	PE8	J5	PE8
18	PE9	K5	PE9
19	PE11	H6	PE11
20	PE13	K6	PE13
21	PE12	J6	PE12
22	PE10	G6	PE10
23	PE14	G7	PE14
24	PB10	J7	PB10
25	PD8	K9	PD8
26	PE15	H7	PE15
27	PD9	J9	PD9
28	PD10	H9	PD10
29	PD15	A2	PD15
30	RESETN	E1	NRST
31	BS_1	J10	PD13
32	+5V		
33	GND		
34	SPI2_MISO	H10	PB14
35	SPI2_MOSI	G10	PB15
36	PA9	C9	PA9
37	PD11	G9	PD11
38	GND		
39	SPI_SCK	C7	PD3
40	CAN1_TX	E8	PD1
41	CAN1_RX	D8	PD0
42	PD4	D7	PD4
43	PC8	F9	PC8
44	PC9	E9	PC9
45	PC7	E10	PC7
46	GND		

WHITE beet		STM32F745	
Pin number	Pin name	Pin address	Pin name
47	USB_D_N	C10	PA11
48	USB_D_P	B10	PA12
49	GND		
50	BOOT	D5	BOOT
51	SWDIO	A10	PA13
52	SWCLK	A9	PA14
53	PC12	C8	PC12
54	t.b.d.	t.b.d.	t.b.d.
55	t.b.d.	t.b.d.	t.b.d.
56	UART2_RX	C6	PD6
57	PP_IN		
58	NC		
59	NC		
60	NC		
61	AC_LINE/CP		
62	AC_LINE/CP		
63	AC_NEUTRAL/PG		
64	AC_NEUTRAL/PG		
65	NC		
66	NC		
67	NC		
68	ZC_NEUTRAL		
69	NC		
70	NC		
71	NC		
72	NC		
73	NC		
74	NC		
75	ZC_LINE		
76	ZC_LINE		
77	NC		
78	ZC_DIGITAL		
79	I2C1_SDA	A5	PB7
80	UART2_TX	B6	PD5
81	PD7	D6	PD7
82	UART8_RX	D4	PE0
83	UART8_TX	C4	PE1
84	SPI2_CS	A4	PB9
85	I2C1_SCL	B4	PB8
86	PC13	A2	PC13
87	PC14	A1	PC14
88	PC15	B1	PC15
89	PA5	H3	PA5
90	PC3	F3	PC3
91	PA4	G3	PA4
92	PC2	E2	PC2
93	ADC_IN2	F1	PC0

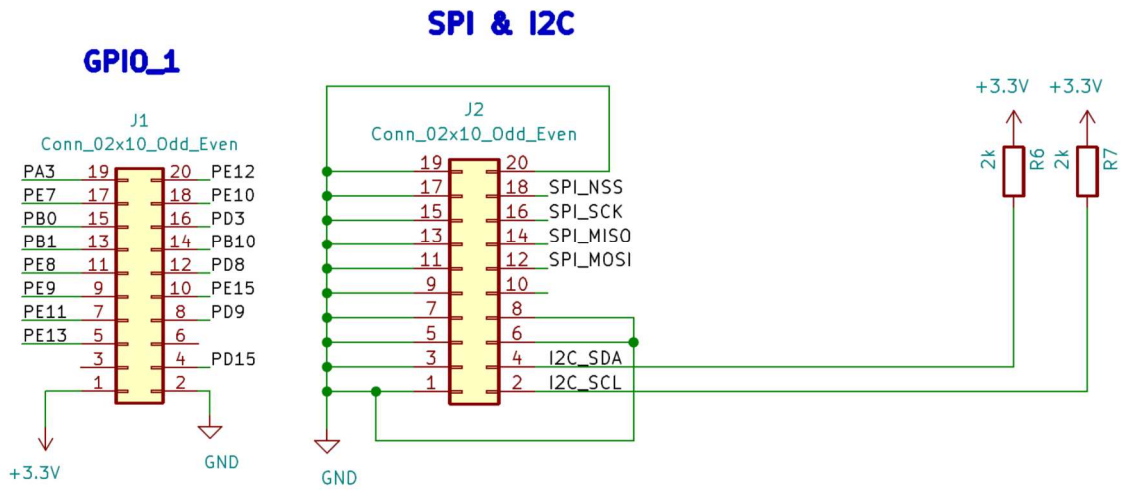
Emulation & Evaluation Tools

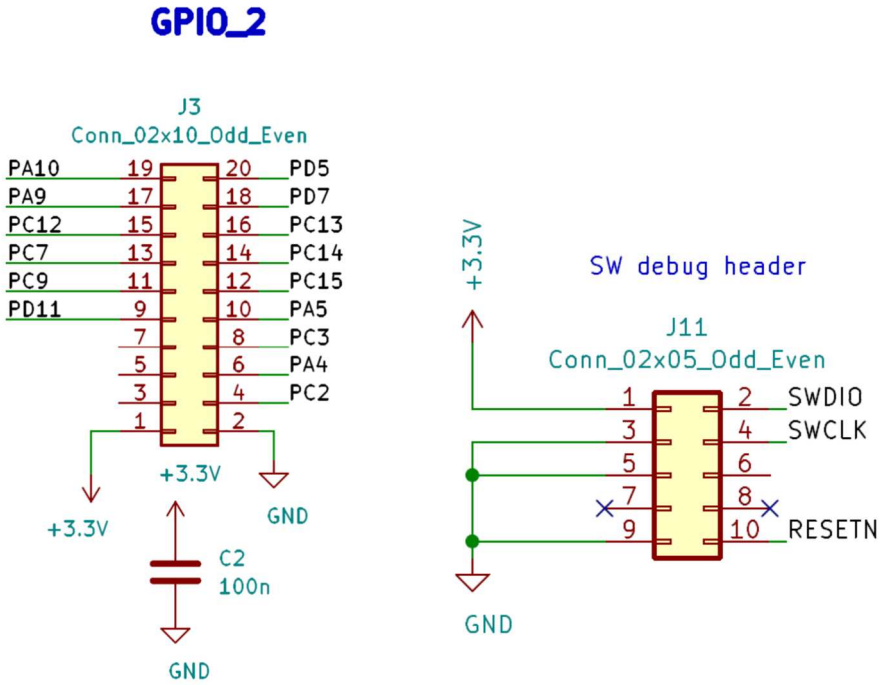
WHITE beet CARRIER and Evaluation board

- provides the physical interfaces for WHITE beet module like, Ethernet, USB and CAN Tranceiver
- makes available all user accessible STM32F7 interfaces of the WHITE beet module on the Pin headers
- provides Coax- and pin terminals for Control Pilot wire and protective earth as well as for Zero Cross in
- gives access to the STM32F7 programming interface via a debug header



Interface Pin header setup

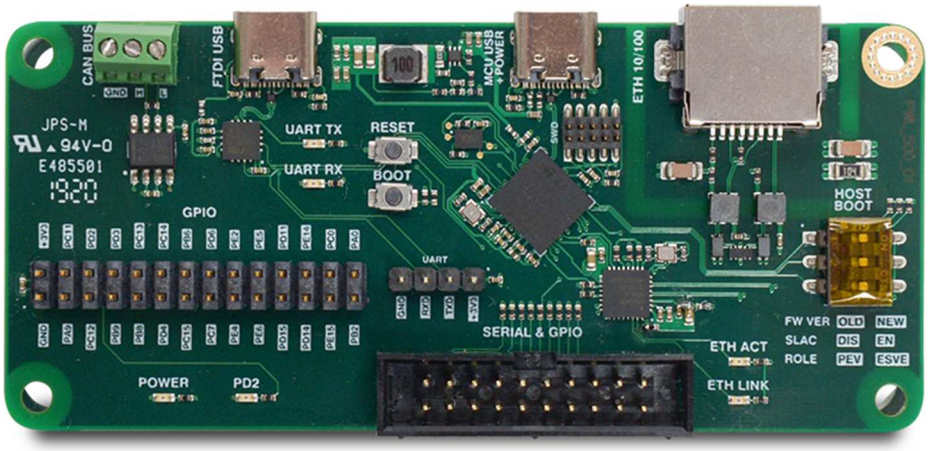


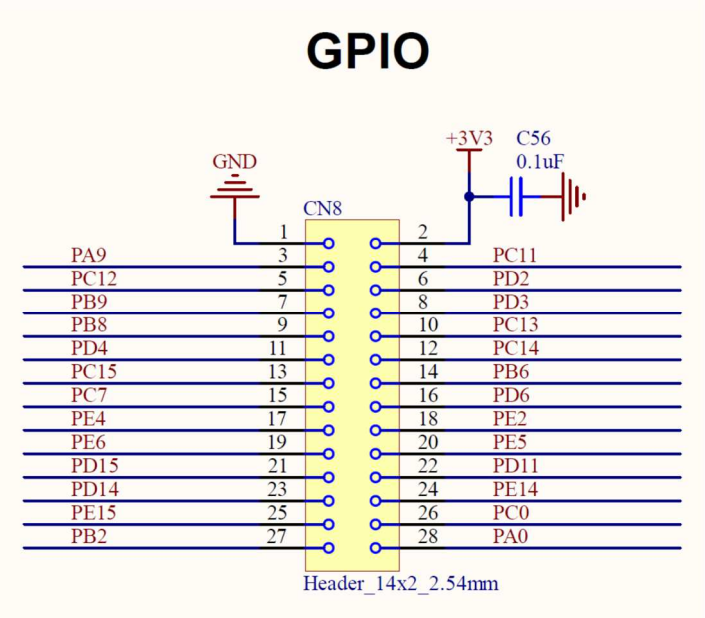


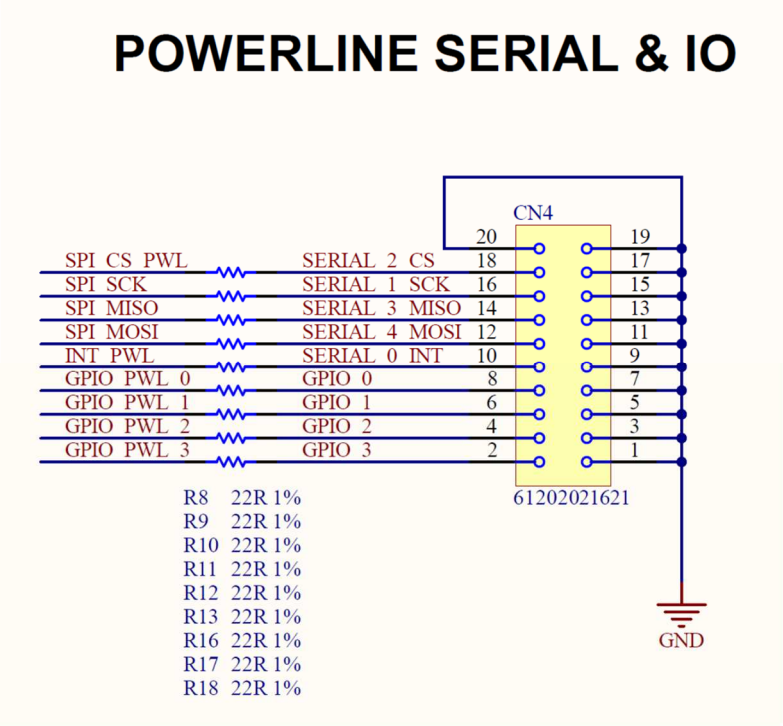
Option 2:

COMMUNICATION board

- based on the same STM32F745VGH6 MCU (like WHITE beet module)
- can act as an interface converter between Ethernet, USB, CAN, SPI, UART and QCA7005 / PLC
- provides different Green Phy firmware options as well as the same software options as available for WHITE beet module
- A combination of both evaluation boards allows testing any possible scenario that can be implemented (customer´s host controller - Carrier board, Com board - customer´s PLC implementation, emulation of WHITE beet modules, etc.)
- External CARRIER boards can be connected to the COMMUNICATION board using FFC (flexible flat cable)





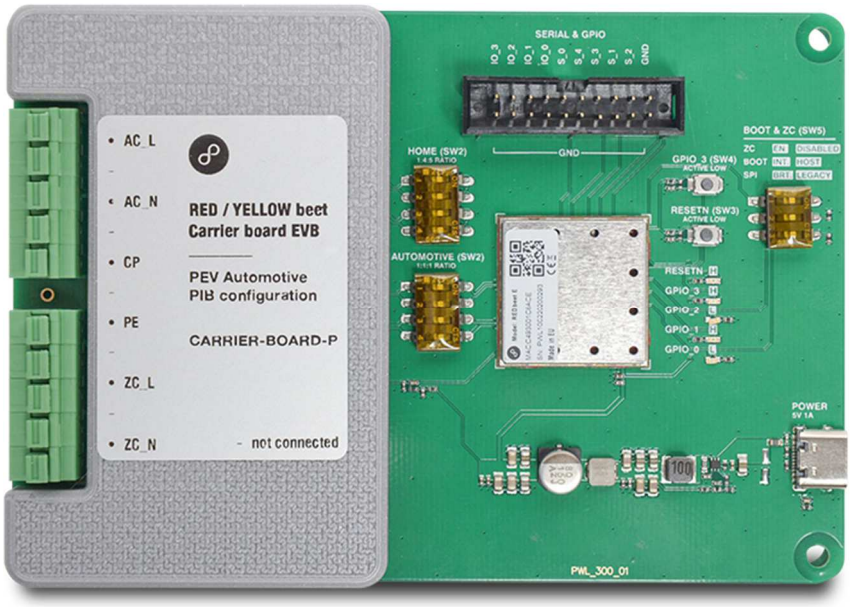


-
-

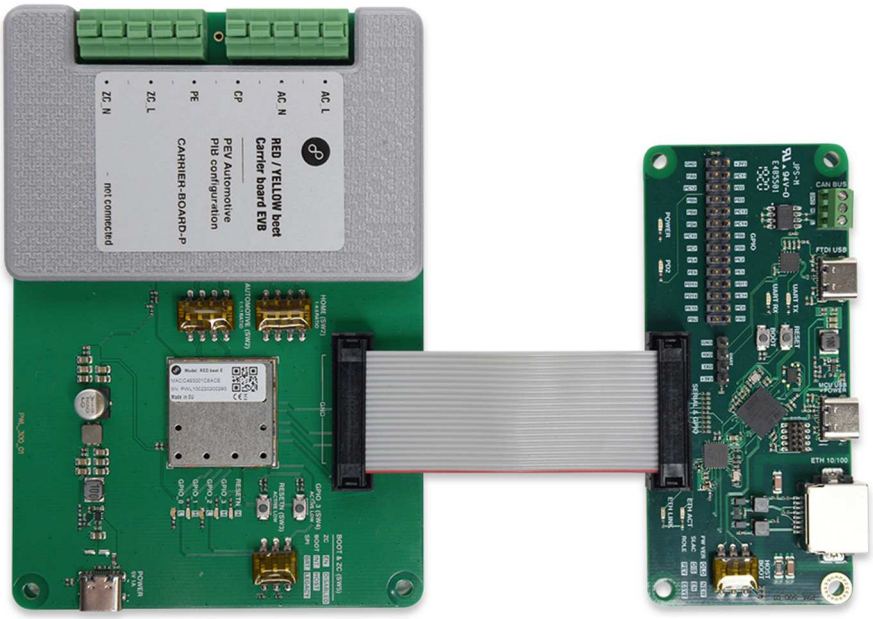
  For details on COMMUNICATION board see here:
- https://www.codico.com/shop/en/powerline-modules/plc-homeplug-green-phy-for-emobility.html

CARRIER board

- includes RED beet module with different PIB file configurations for PEV/EVSE/EN50561 provides PEV / EVSE line coupling options and 1:1:1 transformer for e-mobility / ISO 15118-3 applications
- provides line coupling for long distance communication scenarios (1:4:5 transformer)



For details on CARRIER board see here:
https://www.codico.com/shop/en/powerline-modules/plc-homeplug-green-phy-for-emobility.html



Hardware availability plan

- Engineering Samples available
- Verification and production release expected by mid/end of October
- Mass Production modules expected to be availale by end of Dec. 2020

Software release plan

- Q2/2020: SDK available
- Q3/2020: SLAC/Bridging & Embedded
- Q4/2020: ISO15118 V2G Stack available; Interfaces: SPI / Ethernet
- Q1/2021: , Plug&Charge, Further Interfaces: CAN/USB ECM/NCM;
- Q2/2021: evtl. OCPP
- Q3/2021: ISO15118-20 BPT Implementation

For more informations please contact:

Werner Reis
Product Line Manager @ CODICO GmbH
+49 8141 357264
Werner.Reis@codico.com

More PEV / EVSE - configured eMobility related products can be found here:

https://www.codico.com/shop/en/powerline-modules/plc-homeplug-green-phy-for-emobility.html

Version 1.4, September 24st, 2020