



**INNOVATIVE
ECONOMY**

NATIONAL COHESION STRATEGY

PROJECT CO-FINANCED BY THE EUROPEAN REGIONAL
DEVELOPMENT FUND UNDER THE OPERATIONAL
PROGRAMME INNOVATIVE ECONOMY

EUROPEAN UNION
EUROPEAN REGIONAL
DEVELOPMENT FUND



**AMAA
2018**

IMPACT
CLEAN POWER TECHNOLOGY

DCCS-ECU an Innovative Control and Energy Management Module for EV and HEV Applications



Paweł Irzmański
Impact Clean Power Technology SA

Contents

- ✓ ICPT SA
- ✓ Project targets
- ✓ Module description
- ✓ Core functions
- ✓ Samples of use
- ✓ Conclusion



IMPACT CLEAN POWER TECHNOLOGY

Pruszków, Poland

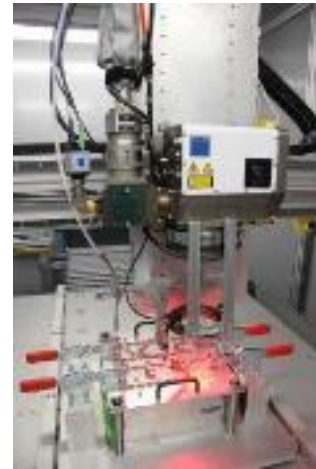
Our focus:

- ✓ Solutions for E-Bus, Trolleybus, Tramway, e-Truck and other electric battery systems in Public Transportation
- ✓ Solutions for AGVs and Telcom backup

Our core business:

- ✓ System design and engineering
- ✓ Battery Pack development and manufacturing
- ✓ Advanced Battery Electronics and Software
- ✓ System Integration

- ✓ Battery Packs Assembly Plant with laser welding equipment, capacity for end of 2018 – 200MWh
- ✓ R&D centre for battery pack desing, electronics and software with 65 engineers



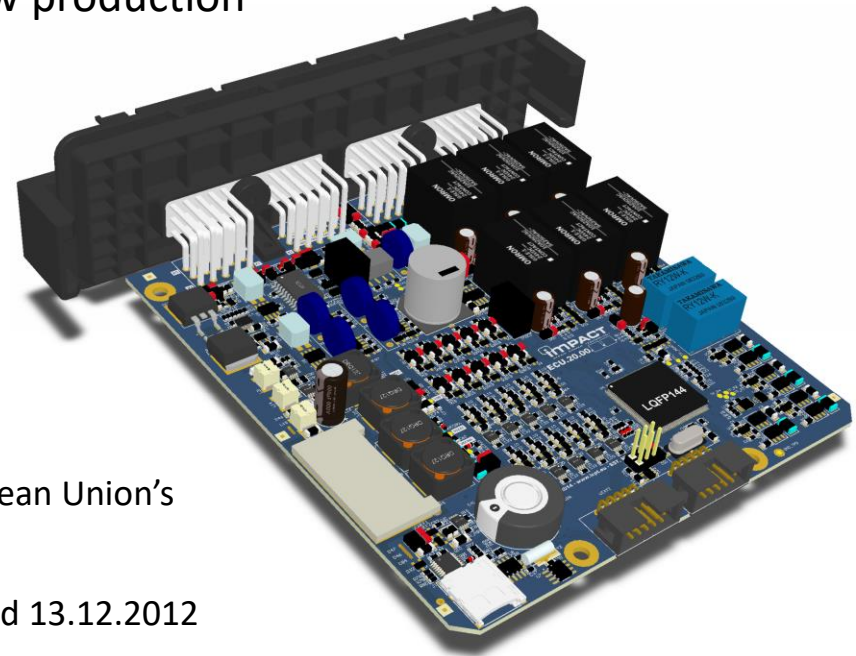
AMAA 2018
Berlin, 11.-12.9.2018

PROJECT CO-FINANCED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
UNDER THE OPERATIONAL PROGRAMME INNOVATIVE ECONOMY

IMPACT
CLEAN POWER TECHNOLOGY

DCCS-ECU Project targets

- ✓ To develop an innovative, universal, and scalable electronic control unit for electric (EV) and hybrid (HEV) vehicles which fulfils intelligent management functions.
- ✓ Electronic Control Unit to be used in a wide spectrum of application areas at the same time keeping low production costs level for a batch below 100 pieces.



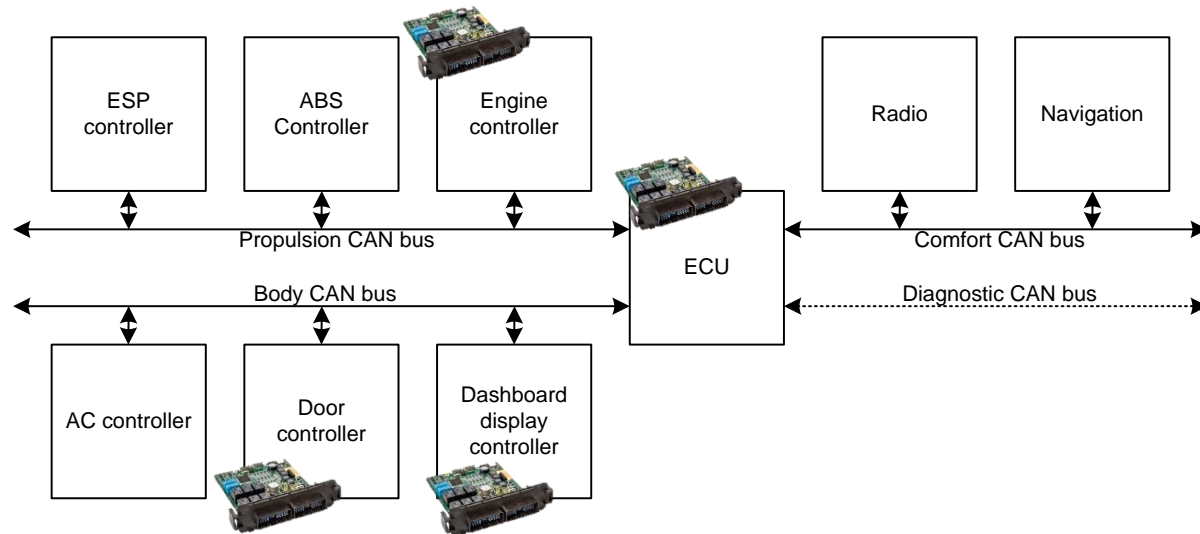
This project has received funding from the European Union's Regional Development Fund.

Contract number: POIG.01.04.00-14-201/12 dated 13.12.2012



Topology and possible placement

- ✓ Designed to be used in multiple roles
- ✓ 4 x CAN 2.0B acting simultaneously to perform different roles in the system
- ✓ Two of them can build a redundant CAN line (SW support)

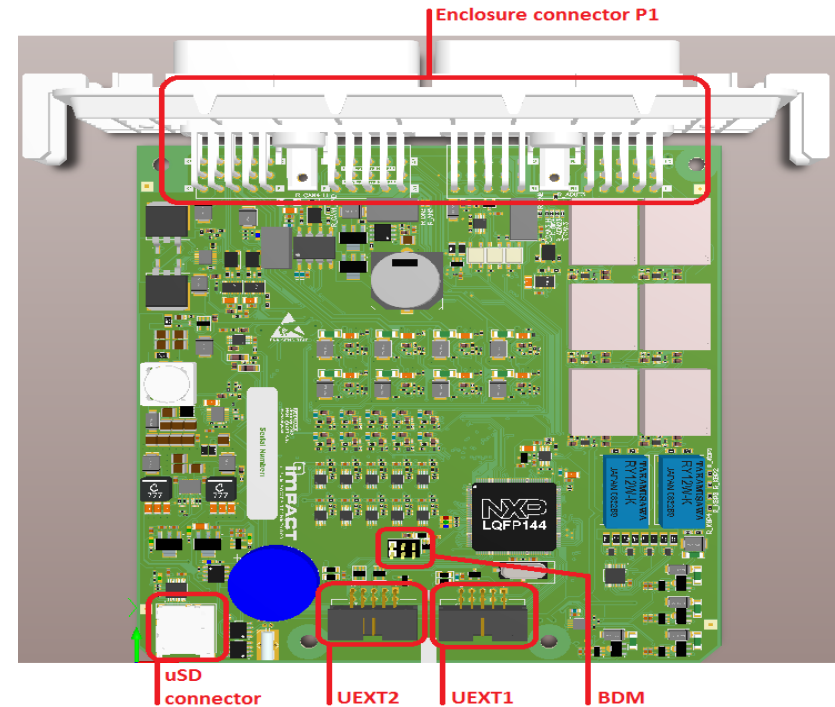


Simplified structure of EV/HEV system



Design specifications

- ✓ Supply voltage range 9-32Vdc
- ✓ Power supply (allows voltage fluctuations up to 15s, but not lower than 6Vdc)
- ✓ Temperature range: -40 – +85 °C
- ✓ Communication (4xCAN 2.0B, LIN, Expansion ports)
- ✓ 1x RTC
- ✓ 189 mm x 185 mm x 58 mm @ Weight <1kg
- ✓ Microprocessor...



Number of inputs	Digital IN	40 (8 with configurable pull-up)
	Digital Timer IN	0.1 Hz – 10 kHz
	Analog IN	8 (0-10V DC/ min. 12bit / 1kSPS)
Number of outputs	Digital OUT	16 (include PWM output and OC function)
	Digital Timer OUT	4 (0-10V / 100mA / 100SPS)
	Digital OUT	8 (1A – max. 4 minutes)

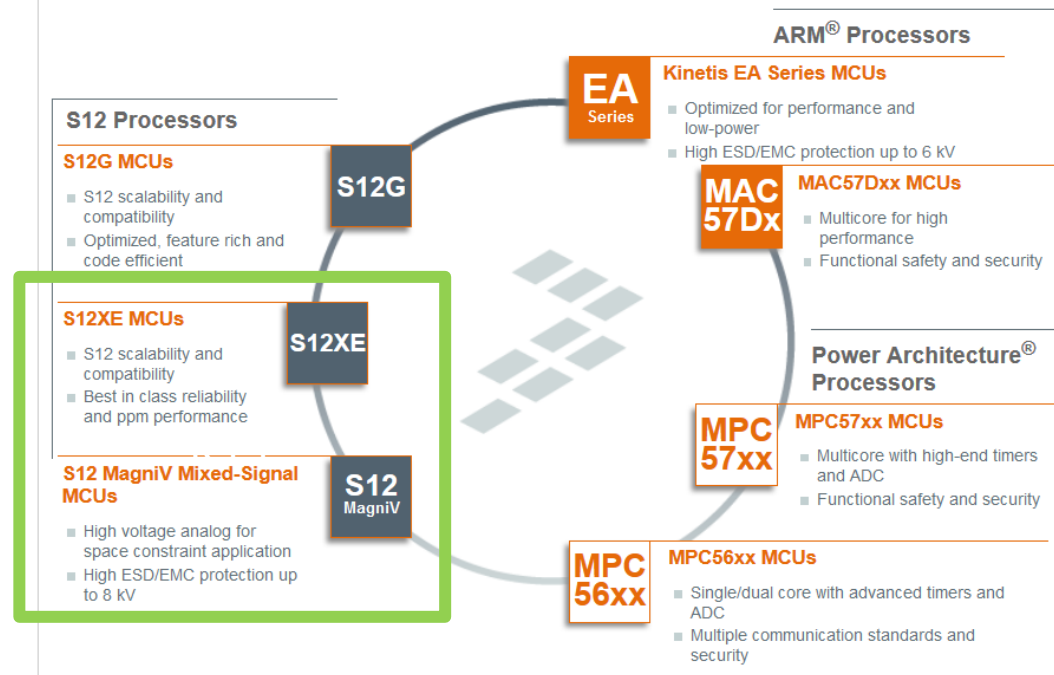


DCCS-ECU MCU

- ✓ A 50/100MHz* NXP S12XE integrated microprocessor with a virtual peripheral coprocessor supplying the necessary processing power
- ✓ CANopen stack as a ready to use module in the coprocessor
- ✓ 1 MB Flash and external non-volatile memory module
- ✓ The computing power was enough in sample applications

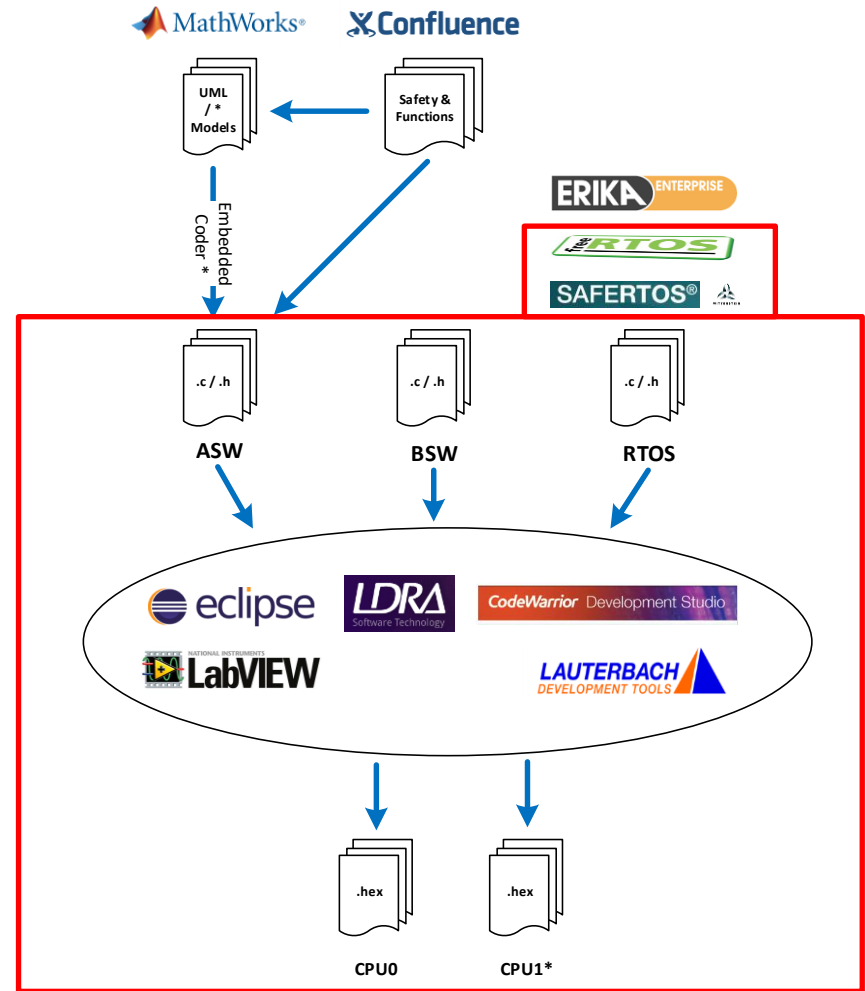
Ultra-Reliable Microcontrollers: Robust, Safe and Secure

Freescale offers the broadest portfolio of ultra-reliable industrial MCUs to provide best-in-class quality, reliability and safety for industrial, infrastructure, automation, communications, transportation and medical applications needed to perform in the harshest environments.



DCCS-ECU algorithm prototyping

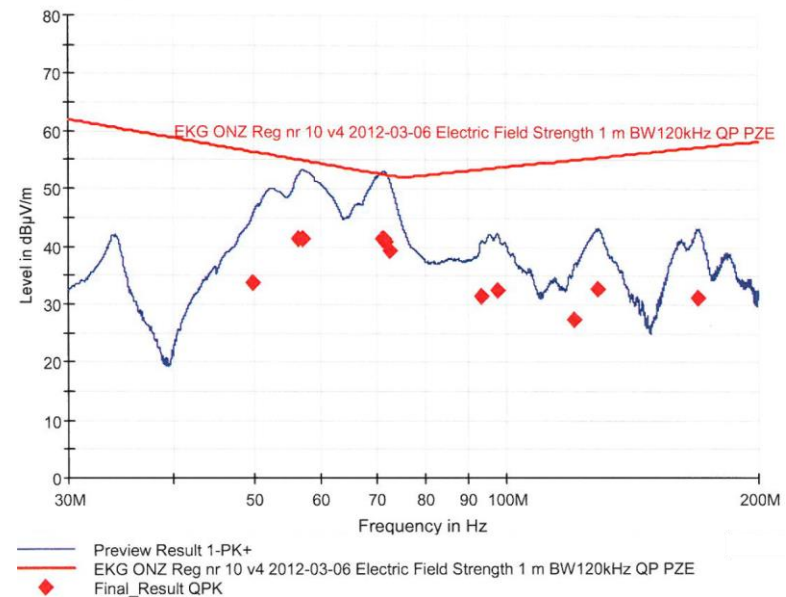
- ✓ Flexible approach to development projects (2 models)
- ✓ Sufficient **intellectual property (IP)** protection, for different teams / company integrating their IP into a common project if needed
- ✓ Support of different **compilers**
- ✓ Test-Driven methodology as a base for development



Performed tests - ESD/EMC



- ✓ The electrostatic discharge (ESD) test methods based on ISO 10605
- ✓ Emission tests both conducted and radiated were performed
- ✓ Pass. based on CISPR 25, IEC 61000, ISO 7637-2

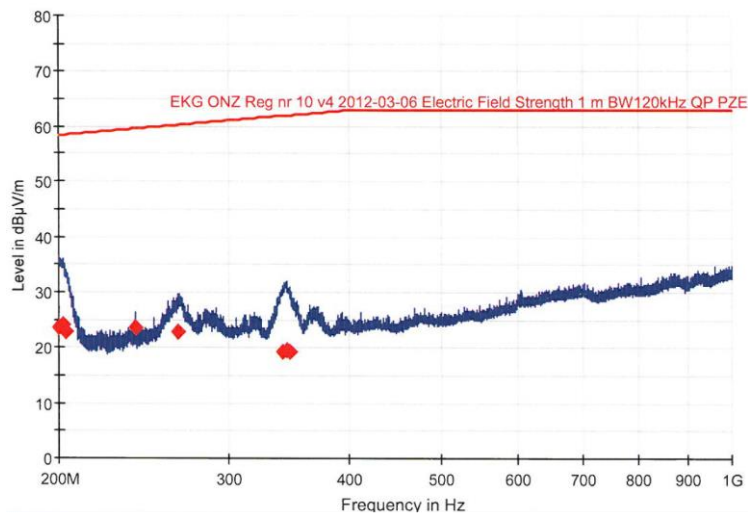


AMAA 2018
Berlin, 11.-12.9.2018

PROJECT CO-FINANCED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
UNDER THE OPERATIONAL PROGRAMME INNOVATIVE ECONOMY

IMPACT
CLEAN POWER TECHNOLOGY

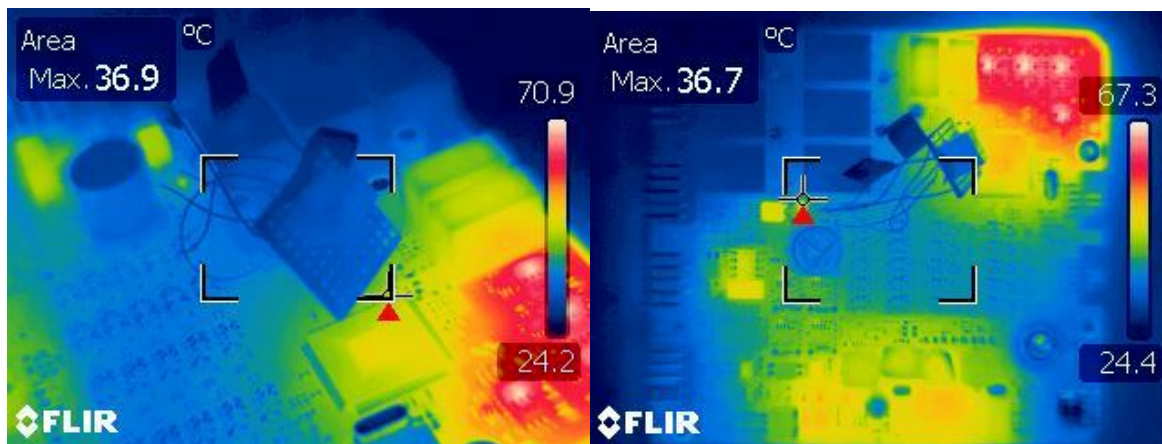
Performed tests –EMC cont. / Stress



— Preview Result 1-PK+
— EKG ONZ Reg nr 10 v4 2012-03-06 Electric Field Strength 1 m BW120kHz QP PZE
◆ Final Result QPK

**Fig 2. Field strength of electromagnetic disturbances
200 MHz – 1 GHz – broadband disturbance**

Overheat stress tests passed (I/O, 12Vdc, PWM
100% 11,2kHz, 16.5Ω load @ 10min)



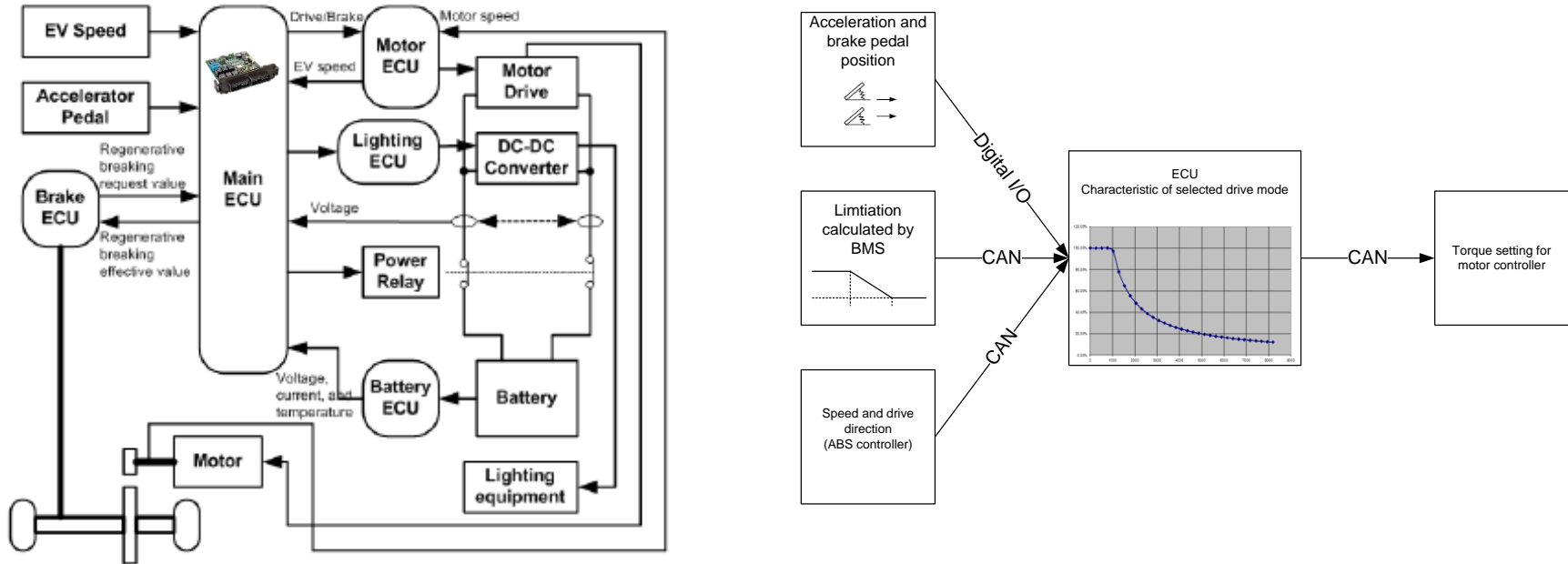
AMAA 2018
Berlin, 11.-12.9.2018

PROJECT CO-FINANCED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
UNDER THE OPERATIONAL PROGRAMME INNOVATIVE ECONOMY

IMPACT
CLEAN POWER TECHNOLOGY

A typical functionality / BSW

The device is shown at work in cooperation with energy storage system of converted FIAT 500 car.



Basic software modules:

- ✓ Semikron's SKAI, SEVCON
- ✓ IEC 62196 support
- ✓ BMSes (CANopen)
- ✓ AES encrypting on the fly
- ✓ CAN Bootloader
- ✓ And much more...



Module and its diagnostics

- ✓ VECTOR based diagnostic and configuration panel (dbc files as source of configuration, system messages and faults)
- ✓ System configuration tool for system developers



AMAA 2018
Berlin, 11.-12.9.2018

PROJECT CO-FINANCED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
UNDER THE OPERATIONAL PROGRAMME INNOVATIVE ECONOMY



Real life applications



AMAA 2018
Berlin, 11.-12.9.2018

PROJECT CO-FINANCED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
UNDER THE OPERATIONAL PROGRAMME INNOVATIVE ECONOMY

IMPACT
CLEAN POWER TECHNOLOGY

Real life applications



AMAA 2018
Berlin, 11.-12.9.2018

PROJECT CO-FINANCED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
UNDER THE OPERATIONAL PROGRAMME INNOVATIVE ECONOMY

Summarizing

- ✓ Project's works on DCCS-ECU module resulted in the creation of a device, which, due to CAN bus popularity, is capable to be connected with literally any contemporary EV/HEV vehicle (especially, when the ideas starts to grow up).
- ✓ In case of more demanding applications the module allows to include additional adapters to add for example FlexRay bus controllers
- ✓ DCCS-ECU is tailor made for small EV/HEV projects with „customized” budget ! ;-)



Thank you!



Warszawska Street 57
05-820 Piastów
POLAND

+48 22 758 68 65

fax: 22 758 76 97

www.icpt.pl

