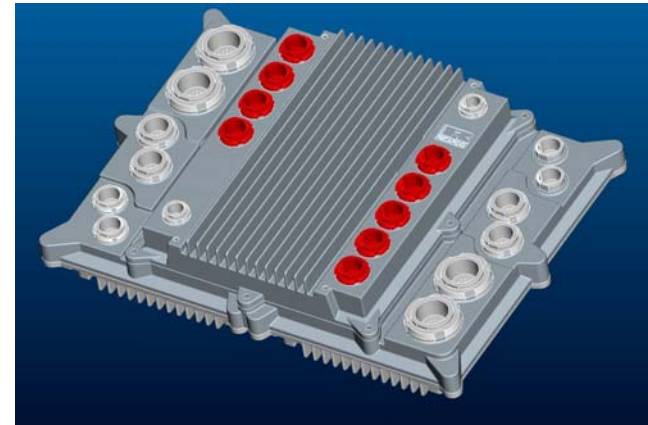


# NEXT GENERATION RAPID PROTOTYPING CONTROL SYSTEM

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# WHAT IS A RAPID PROTOTYPING SYSTEM?

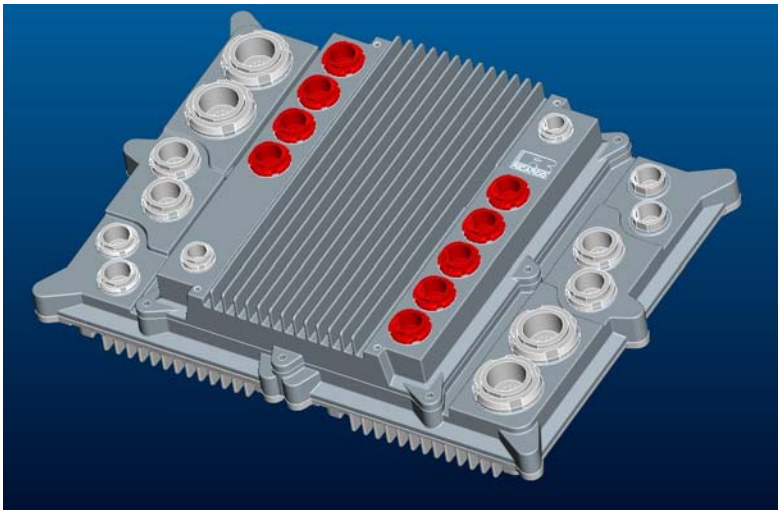
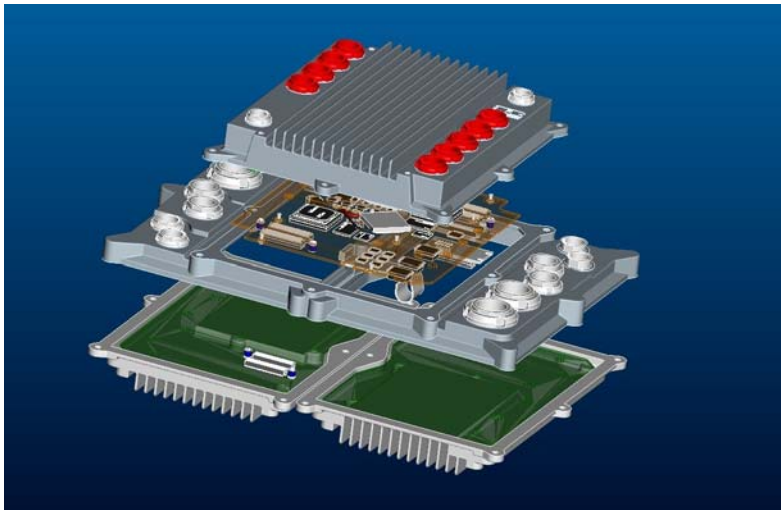
- It enables engineers to go directly from graphical models (e.g. Simulink) to implementation on real systems
- It can support functional testing of controls/diagnostic algorithms on new components and systems
- Supports requirements generation by early testing of functions
- It can allow for sub-system integration into a larger system
- It can be an enabler for advanced technology projects

## Why do we need a rapid prototyping system?

- The implementation of automotive systems becomes continuously more complex
- Customers require confidence and hence results quickly
- Minimise project costs for 'reinventing-the-wheel'.
- Allows implementation of a pilot version of the intended product
- It can help answer the 'what if..' questions earlier in a product development cycle.

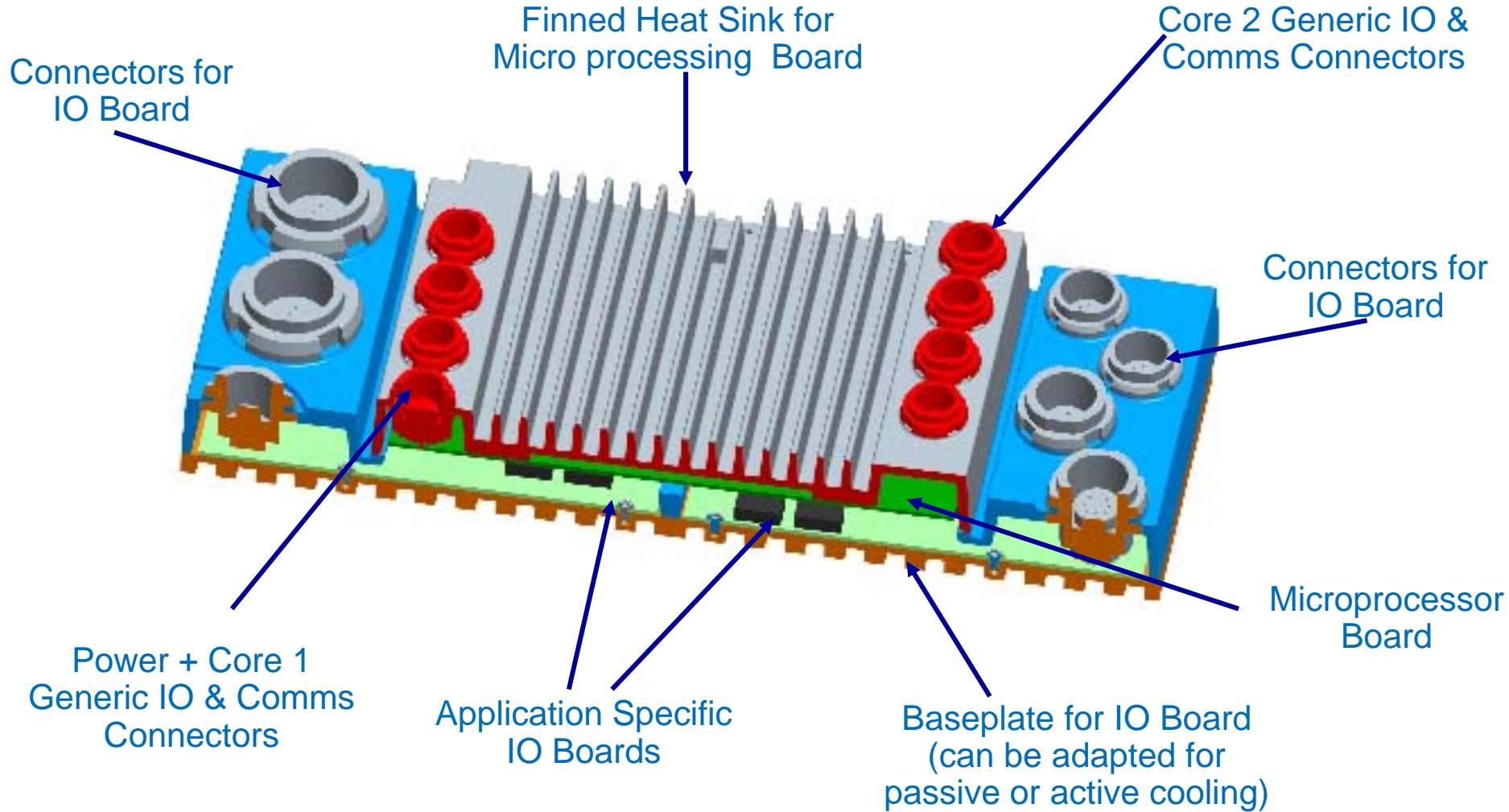
# PERFORMANCE MODULE SUPPORTING RAPID PROTOTYPING

- Development platform for state of the art ECUs
  - Engine,
  - Transmission,
  - Chassis,
  - Body
  - Telematics
  - Steering
  - Braking
  - Supervisory
  - Control-by-wire
  - Vehicle dynamics
  - Integrated safety
  - Other vehicle control systems
- Rugged Design
- Flexible, modular and scalable architecture
- Advanced software development:
  - Model-based, Autocode, Autosar, ISO26262
  - Simulink/Stateflow, xCP, 'C' Code, ASCET, ETAS Calibration / Development Tools



# EMBEDDED PROCESSING UNIT – MECHANICAL

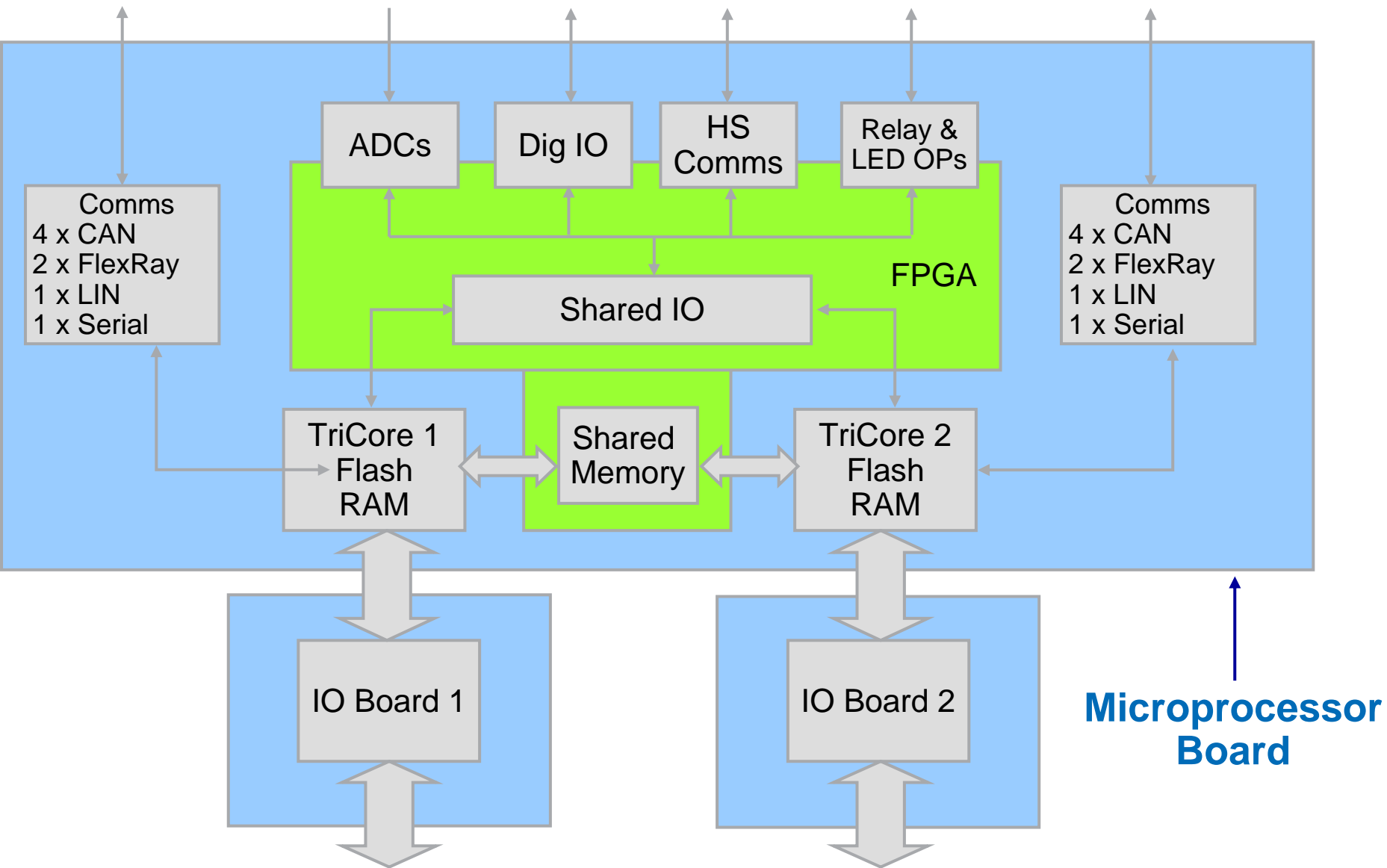
APPROX SIZE 225 X 225 X 50MM



# EMBEDDED PROCESSING UNIT ARCHITECTURE (SIMPLIFIED)



External World



# EMBEDDED PROCESSING UNIT

- 2 Infineon TriCore Microcontrollers
  - Significant more processing power than best of current production systems
- 12 Analogue channels for system sensors (12 bit conversion)
- Power supplies for external sensors
- 4 Differential high speed analogue inputs
- Digital Frequency inputs (VR/Hall selectable) for speed sensors
- Switch inputs
- Relay outputs for control of high current supplies
- General Purpose outputs for control of actuators and indicators
- Vehicle communication busses
  - (4) – FlexRay
  - (8) – CAN
  - (2) – LIN
  - (2) -  $\mu$ Second Bus / MLI
- Parallel high performance inter-module communication buses (Ethernet and USB)

## ENGINE IO

- 8 Cylinder pressure measurement channels (3/4degree at 6000rpm) Hall/VRS for P and S
- Peak/Hold/Saturated) injector solenoid drivers
- High voltage ignition drivers
- Selection of generic drivers (HS, LS,PWM, HB)
- Selection of generic analogue inputs e.g. for throttle, temperature measurements
- Selection of generic digital inputs

## DIESEL INJECTOR DRIVER IO

- Drives most of the known solenoid and piezo type of diesel injectors
- Drive injector up to 8/cycle @6000RPM
- Drives up to 8 diesel injectors (pairs of 2), maximum 4 simultaneously
- Dynamically adjustable output current and voltage shape of the driving cycle
- Output parameter measurement (actual current/voltage)

## GENERAL PURPOSE IO



- Battery and ground supply switched outputs for lamps, relays, valves & motors
- Flexible Analog Inputs (programmable for gain and offset) for system sensors
- High speed signal outputs to control for example external motor controllers
- Chassis, body, telematics, steering, braking, supervisory, Control-by-wire, Vehicle dynamics, integrated safety & other vehicle systems

## TRANSMISSION IO

- Support dual-clutch hydraulically actuated system
- PWM capable HS & LS Drivers for proportional control
- Stepper motor driver
- General use analogue inputs with programmable amplification
- Thermistor inputs with programmable range
- Rotational speed & position measurement (Hall / VRS)

# SOFTWARE / USABILITY FOR CONTROL ENGINEERS



- Support for mathematical modelling of systems – Matlab/Simulink support
- Automatic code generation
- Integrated environment
- Flexible tool support
  - Low cost (minimal additional licenses required) for entry level ... through to
  - Full **AUTOSAR development environment**
- ETK Integration – ETAS 3<sup>rd</sup> Party interface for detailed runtime monitoring of system and applications

