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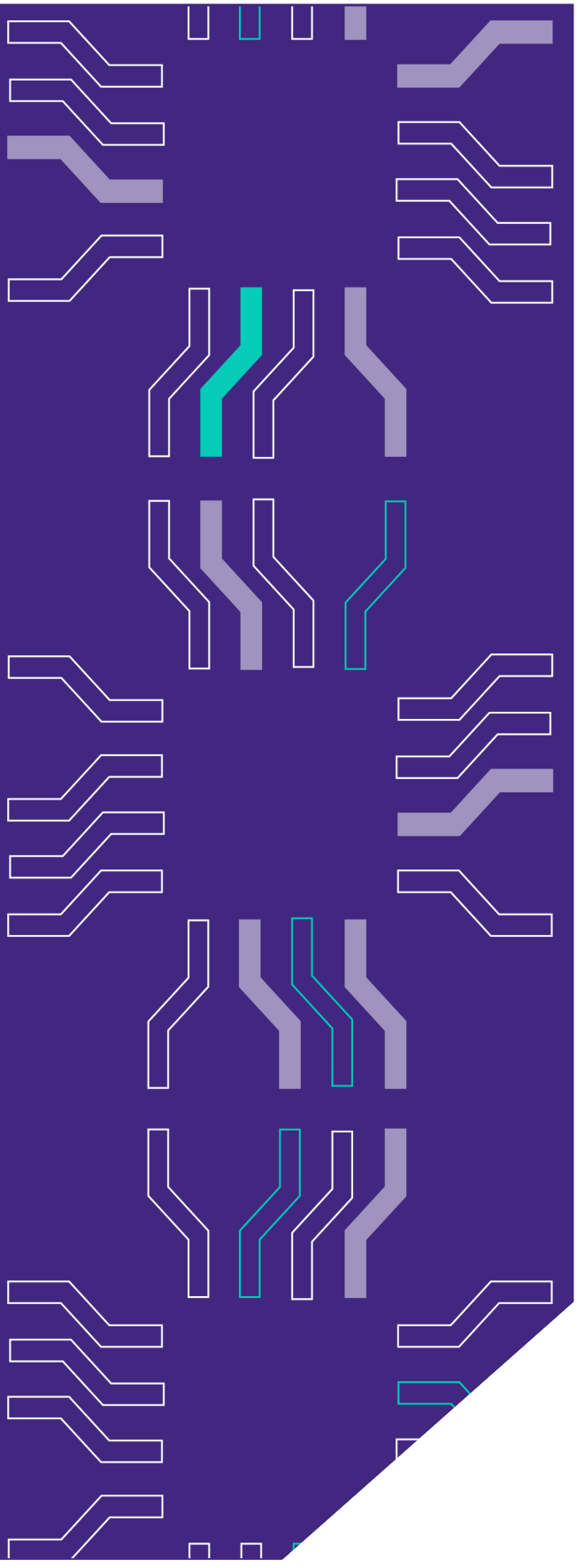
H2-ICE Engine Control Unit

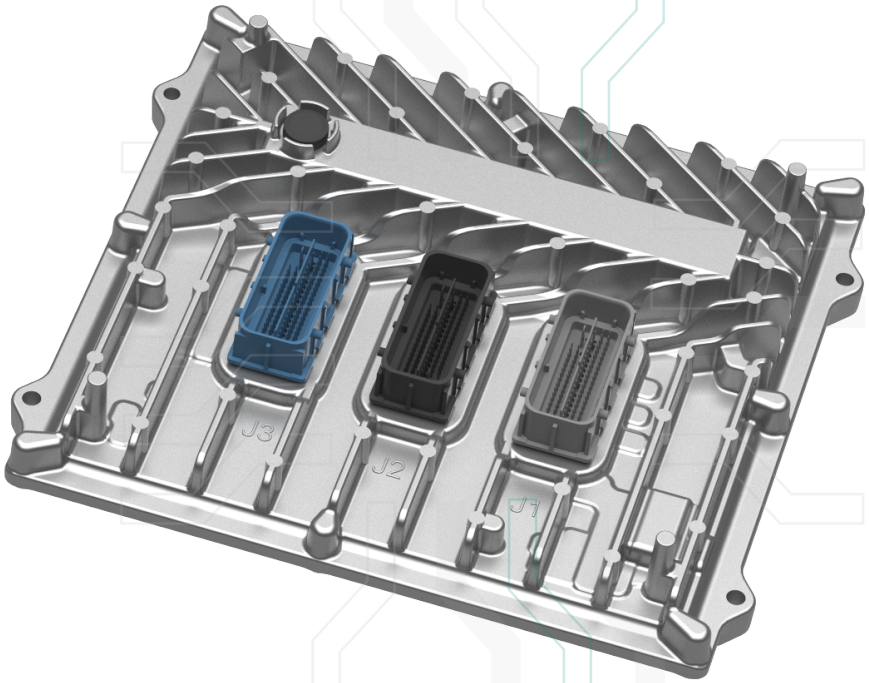
Technical Specification



Control systems **you control**

About H2-ICE Engine Control Unit

The DS ECU-H2 is a 12V/24V electronic control unit with high integrated drivers for Solenoid Control Valves (boosted and battery direct), DC Motors controller, flexible analog and digital sensors signal acquisition, CAN, LIN, SENT and Ethernet (protected) communication busses using a hexacore microprocessor.



Referenced Standards:

Operating Voltage: ISO 16750-2 A&E code (12V/24V)

Operating Temperature: ISO 16750-4 K code (-40 +105 °C)

Intrusion Protection: IP6K9K, IP6K8

Vibration: ISO16750-3 / Chassis Installed

Collision: IEC 60068-2-27 / Installed in a secured position

EMC: ISO 11452-4, IEC CISPR 25, ISO 10605, ISO 7637-2/3

About H2-ICE Engine Control Unit

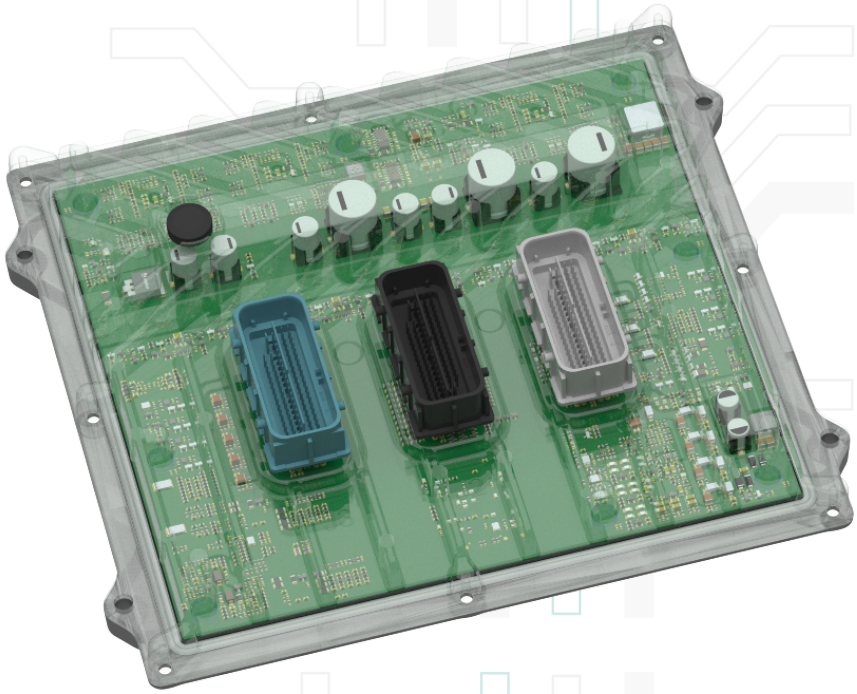
Environmental:

Supply Voltage:
6V / 16V @12V system
10V / 32V @24V system

Operating Temperature: -40°C to +105°C (T Ambient)

Environmental Class: IP6K9K (hydrophobic breather membrane on housing)

Load Dump (max 350ms):
34V @12V system
58V @24V system



MCU: Infineon AURIX™ TC399X (6 cores, 300 Mhz; 16MB Flash; 2048kB RAM)

Housing Dimension: 279 x 242 x 48 mm

Housing Material: Lega AN AC 47100 (sealed housing with Gore-Tex membrane; internally AC coupled with Power GND)

Connection System: Molex MX123 family (J1: 73 ways J2: 76ways J3: 73ways)

Technical Specifications

4x 5V Buffered Sensor Supply Outputs
- 2x 300mA current load
- 2x 50mA current load

12x Boosted Flexible Solenoid Valve Control (drivers banket x2)
- Up to 12x HV injectors (DI Injectors – DCDC up to 65V)
- Up to 12x PFI Injectors (mutually exclusive with HV injectors)

6x Solenoid Flexible Valve Control Outputs
- Up to 6x PFI Injectors (non-banked)
- Up to 6x Pressure Control Valve with current recirculation (mutually exclusive with PFI)

Low Side Outputs
- 4x Discrete LS Output **(Load Current: 2A)**
- 7x Discrete LS Output **(Load Current: 0.5A)**
- 1x Reverse Battery Protected LS Output **(Load Current: 0.5A)**
- 2x UHEGO Sensor Heater Driver

High Side Outputs
- 4x Discrete Output **(Load Current: 0.5A/2.0A)**
- 8x Electronic Spark Triggers **(Spark IGBT Control)**
- Generator L terminal

Full H-Bridge
- 5x Full H-Bridge Outputs **(Hold Current: 3A / Peak Current: 9A)** – 2 with Current Feedback

Analog Inputs
- 20x Standard Analog Inputs **(4x 220kΩ PD; 12x 2.7kΩ PU; 2x 4.7kΩ PU; 2x 240Ω PU)**
- 23x Flexible Analog/Timer Input (PullUp/PullDown)
- 7x Flexible Thermistor Inputs
- 4x Knock Sensor Inputs

Technical Specifications

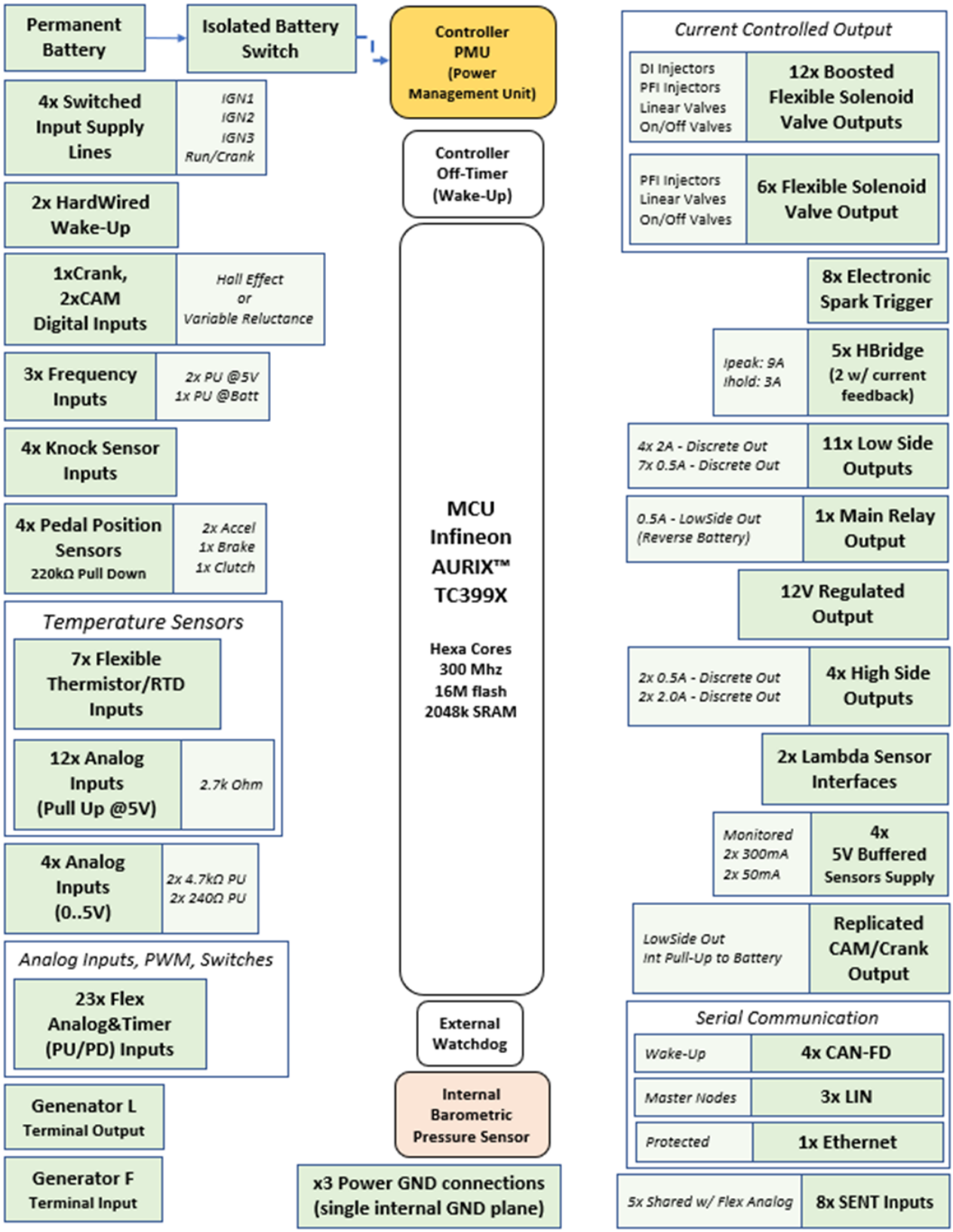
Frequency Inputs
- 2x CAM (Digital Sensor or Variable Reluctance)
- 1x Crank (Digital Sensor or Variable Reluctance)
- 3x Spare (2x PullUp @5V; 1x PullUp @Vbatt)

Other Inputs
- Up to 8 SENT
- 2x UHEGO
- 1x Generator F terminal

Internal Sensors
- 1x Barometric Pressure
- 1x Microprocessor Temperature

Communication
- 4x CAN_FD
- 3x LIN
- 1x Ethernet (protected)

Block diagram



Software Features

- Software modularity allowing different software build composition to support multi fuel ICE applications
- Inputs and outputs handling software architecture allows specific implementation based on customer requirements
- Advanced H2-ICE software features developed based on Virtual environment and validated on physical H2-ICE
- Diagnostics and services infrastructure flexible architecture supporting customer specific implementation
- Detailed software documentation to support engine calibration activities
- Software developed according to AUTOSAR standard allowing easy integration of 3rd party software modules with possible custom interface layer for 3rd party non AUTOSAR based modules

Software Features

Input and Output management		
Accelerator Pedal Positioning management	Crank and CAM Sensor Control and diagnostics	Air, Charging and EGR Actuators (Throttle, VGT, EGR, EGR cooler bypass)
Mass airflow sensor reading and diagnostics	Barometric Sensor reading and diagnostics	Outside air temperature reading and diagnostics
Port Fuel injection control and diagnosis	Direct Fuel Injection control and diagnostics	Hydrogen Rail pressure and temperature sensor
Hydrogen Metering Unit/ Pressure regulator	Spark ignition coil command and diagnostics	
Engine coolant Temperature sensor reading and diagnostics	Engine Oil pressure sensor reading and diagnostics	Knock Sensor management and diagnostics
Intake/Exhaust sensor management and diagnostics	O2 sensor management and diagnostics (lambda)	NOx sensor reading and diagnostics
Active blow by Separator	Starter management	Alternator management
Malfunction Lamp	J1939 diagnosis message (DM1, DM11) and datastream management	
CAN communication management		

Software Features

Engine Control Strategies			
Power moding management	Low voltage management	Engine Mode detection	Engine position and engine synch.
Air Charging Control, Air management	Lambda control strategy	Intake/Exhaust air charging and boosting Models	
Combustion set point and coordinator	Combustion transient management	Misfiring strategy	Knock Control strategy (fast and slow correction)
Injection management and feedback monitoring		Fuel Rail Pressure Control and Diagnostics	
Torque Chain (Arbitration, Loss calculation, Remedial action, limiter, reserve)		Engine control speed management	Backfire detection strategy
Thermal and Oil Management (Coolant temperature, Engine Oil temperature model)		Active blow by Separator strategy	Crankcase System diagnosis
SCR model predictive control and diagnosis	Controller Malfunction Remedial Actions	Malfunction Lamp management	Inducement for EU NRMM Regulation
Diagnosis infrastructure and remedial actions			
Service infrastructure			

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