

NEXT GENERATION RAPID PROTOTYPING CONTROL SYSTEM

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The following abstract is in response to the call for papers in support of the 2008 Power & Energy Workshop sponsored by the National Defense industrial Association Michigan Chapter. This presentation describes the design and development of an integrated system for the next generation of rapid prototyping of military vehicle electronics. The system is designed to be flexible with a modular and scaleable architecture that is suitable for application to diverse areas such as gasoline and diesel engine control, transmission and advanced driveline control, hybrid electric and battery management control, chassis, body, telematics and integrated safety. The full presentation provides an overview of the hardware design, IO boards, mechanical concept, software architecture and development tools.

At the heart of the system are two Infineon TriCore TC1797 microcontrollers that provide substantial processing power, vehicle communication buses such as FlexRay, CAN and LIN, high speed chip to chip communication interfaces like μ Second Bus (MSC), MLI and highly integrated peripherals. These microcontrollers are integrated onto a PCB with power supplies, external memory, communication physical layers and generic input/outputs so that the system can function standalone as a high-performance single-board computer.

The microcontroller board also accommodates up to 2 input/output (IO) modules that can include the power electronics to interface directly to vehicle

actuators and enable configuration of the system to a specific application. The processor board and IO modules are housed in a sealed enclosure that provides thermal management of the unit in harsh environments.

In addition to the vehicle communication buses, a number of parallel, high performance inter-module communication buses are provided based on a 100Base-TX Ethernet physical layer. These buses may be used to connect many modules together without adding any load to the vehicle communication buses and enable the system to be expanded as coupled or distributed multi-processing systems. The high performance inter-module communication buses may also be connected to an industrial PC, such as a PC104+ stack to further enhance the system processing power and to enable the use of 3rd party products such as mass storage and GSM/GPRS modules.

MathWorks tool integration is supplied by default to enable Simulink and Stateflow models to be auto-coded and run directly on the system. If connectivity is required to the ETAS toolchain, ETK boards may be directly integrated onto the microcontroller board. The architecture of the base system software is AUTOSAR compliant, and will enable 3rd parties to add their own run-time environment and application software into the system.