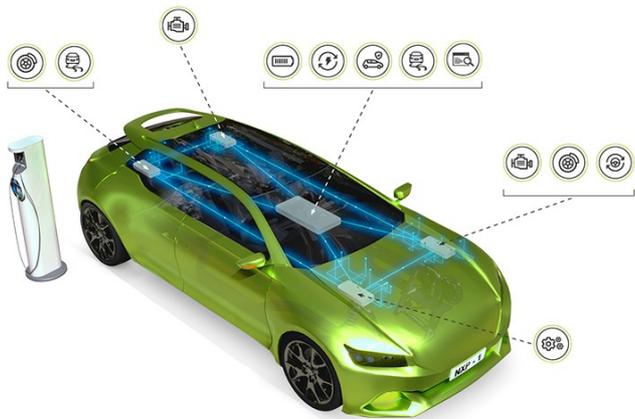# CAN *Newsletter Online*

Processors for domain and zonal automotive control

NXP extends its S32 automotive platform with S32Z and S32E supporting 24 CAN interfaces. The recent UDE debugger by PLS enables multi-core debug and trace support for the real-time processors.

S32Z and S32E processors are dedicated for real-time control in future automotive applications (Source: NXP)

The scalable 16-nm processors help to accelerate integration of automotive real-time applications. S32Z family is dedicated for safety processing as well as domain and zonal control, while the S32E processors are suited for electric vehicle control and smart actuation. Evolution to domain and zonal architectures enables carmakers to optimize wiring harnesses, reduce cost and weight and implement a more scalable and cost-effective, software-centric approach of vehicle development. To design real-time processors with the performance and deterministic behaviors requires deep collaboration across the automotive ecosystem. Robert Bosch was a key partner in the development process.

The processors include eight Arm Cortex-R52 processors cores that operate at up to 1 GHz and Cortex-M33 cores for system management and communications. The components isolate independent real-time applications with "core-to-pin" hardware virtualization and resource firewalls for freedom of interference. An up to 64-MiB integrated flash memory is available for large, zero-downtime over-the-air (OTA) updates. Support of LPDDR4 DRAM and flash expansion memory is offered for large applications and Autosar Adaptive applications. A communications accelerator with 24 CAN interfaces is supported, along with a 1-Gbit/s Ethernet switch with time-sensitive networking (TSN), provides vehicle data seamlessly to virtual ECUs to improve efficiency and streamline software development. A hardware security engine (HSE) supports secure boot, accelerated security services, and key management. The processors are certified according to ISO 21434 for cybersecurity and ISO 26262 for ASIL D (automotive safety integrity level) functional safety.

NXP offers system support for the processors to accelerate customer designs. The support includes the co-developed FS86 ASIL D safety system basis chip (SBC) and PF5030 power management IC (PMIC). These provide enhanced safety features and in-vehicle networking support with Ethernet switches and PHYs (physical interfaces), CAN transceivers, along with other analog companion chips. The latter comprise high-voltage inverter gate drivers and battery cell controllers. First processor samples (S32Z2 and S32E2) are available to lead customers. Silicon evaluation, software development, and rapid prototyping can be accelerated using the GreenVIP (vehicle integration platform) software with the GreenBox 3 development platform. The platform is supported by a wide range of software and tools as well as a strong partner ecosystem.

At the Embedded World 2022 in Nuremberg, NXP has presented a technical paper on "Key technologies for enablement of multi-core, real-time domain controllers". The speaker showcased the S32E processor in action with a "Safe multi-ECU integration" demonstration focused on multi-core performance and fault-tolerance.

Debugger platform for S32Z2 and S32E2

At the Embedded World 2022 exhibition PLS Programmierbare Logik & Systeme introduced the UDE 2022 (Universal Debug Engine) supporting the S32Z and S32E processors. The intuitive debugger platform gives developers access to the recent NXP processors. The main Cortex-R52 processor cores, the Cortex-M33 system management and communication cores as well as the GTM (generic timer IP module) are visible and can be controlled within one debugger instance. There is no need to open separate debugger instances for the different core architectures. The UDE allows debugging of C/C++ as well as assembly code for the Cortex-based cores including the Arm and Thumb-2 instruction set. The tool supports GTM-C compilers from various compiler vendors.

The recent UDE 2022 debugger by PLS enables multi-core debug and trace support for S32Z and S32E (Source: PLS)

The integral Memtool add-on enables secure programming of the integrated memories and offers support for on chip one-time programming. By using the multi-core run-control management, the tool allows developers to control the processor cores using run-mode debugging. For non-invasive debugging and runtime analyses of multi-core applications, UDE provides functions based on recorded trace information from the device's Arm Coresight trace system. This allows both the program flow and data transfers to be recorded. For recording the trace data, either the UAD2next or the UAD3+ from the PLS' Universal Access Device family can be used.