ISSUE: July 2025

Digital Signal Controllers Offer Improved PWM Resolution And ADC Speed

Microchip Technology has added the dsPIC33AK512MPS512 and dsPIC33AK512MC510 digital signal controller (DSC) families to its dsPIC33A DSC product line. The devices enable the implementation of computation-intensive control algorithms for improved energy efficiency in motor control, AI server power supplies, energy storage systems and complex sensor signal processing with machine learning (ML)-based inferencing.

"As AI servers and data centers continue to grow, the need for more efficient power conversion is essential. With specialized peripherals and the high-performance core in the dsPIC33AK512MPS family, developers can now achieve significant energy savings and shrink their power supply footprints," said Joe Thomsen, corporate vice president of Microchip's digital signal controller business unit. "The new dsPIC33A DSC families are packed with advanced features that enable efficient and reliable designs for modern power conversion, motor control and sensing applications."

The dsPIC33AK512MPS family delivers precise, high-speed control through what's described as industry-leading 78-ps high-resolution pulse width modulation (PWM) generators and low-latency 40-Msps ADCs, enabling fast and accurate control loops essential for optimizing the performance of SiC- and GaN-based dc-dc converters.

Additionally, dsPIC33AK512MPS devices include advanced security features, an integrated touch controller and a high pin count of up to 128 pins. The dsPIC33AK512MC family is designed to offer low-latency, 40-Msps ADCs and 1.25-ns PWM resolution, providing a feature- and cost-optimized solution for multi-motor control and complex embedded applications.

The dsPIC33A DSC families, with up to 512 KB Flash and a rich peripheral set (see the figure), integrate a double precision floating-point unit to accelerate mathematical computations and leverage a 32-bit architecture for seamless adoption of model-based design code. Their enhanced instruction set and digital signal processing (DSP) capabilities, including single-cycle MAC operations and a 200-MHz core speed, make these devices highly efficient for low-latency, real-time control applications. Supported by the MPLAB Machine Learning Development Suite, dsPIC33A devices streamline the ML workflow by automating data preparation, feature extraction, training, validation and firmware conversion of optimized models.

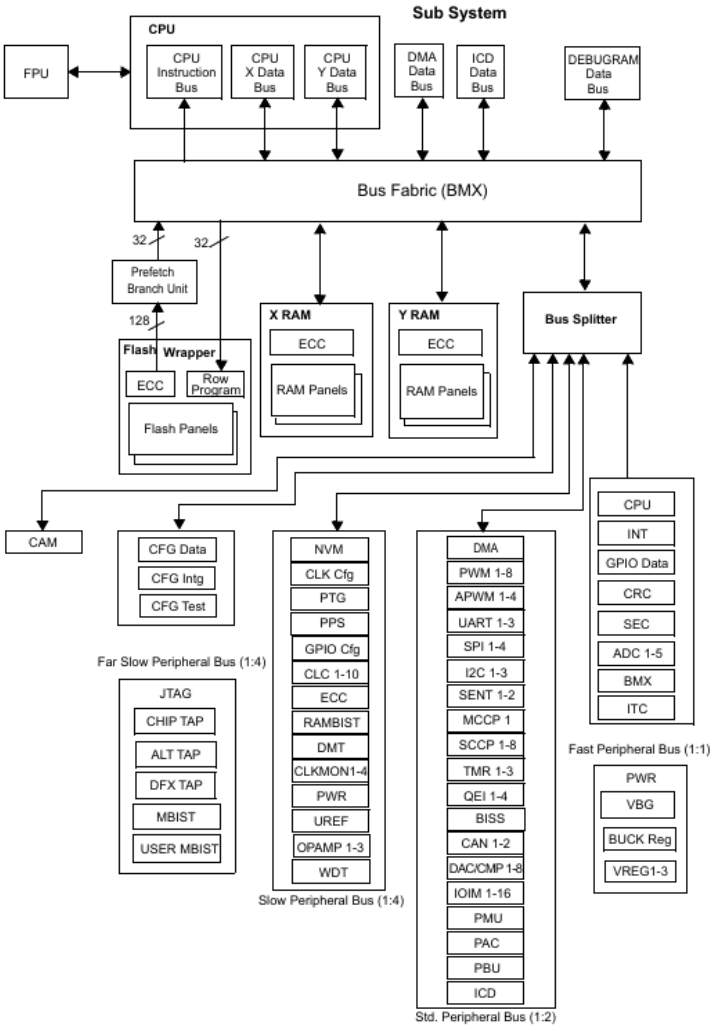
"dsPIC33A DSCs from Microchip provide high performance and reliability for complex automotive Electronic Control Units (ECUs)," said Norbert Weiss, managing director at Lauterbach GmbH. "Combined with the support of our latest TRACE32 solutions, we help dsPIC33A DSC customers accelerate their time-to-market using our leading debug and trace tools from the start of the development process."

With a range of hardware safety features, dsPIC33AK512MPS/MC DSCs are compliant with functional safety standards and are developed in accordance with ISO 26262 and IEC 61508 processes, making them suitable for safety-critical automotive and industrial applications. To further enhance system-level security, the dsPIC33AK512MPS DSC family includes integrated crypto accelerators and a Flash security module, enabling immutable root of trust, secure boot, secure firmware upgrades and secure debug capabilities.

"The combination of dsPIC33A DSCs and our pre-certified safety-critical real-time operating system, SAFERTOS, simplifies the development of safety-critical applications," said Andrew Longhurst, managing director of WITTENSTEIN high integrity systems (WHIS). "This system level solution empowers our clients to deliver reliable and efficient solutions that meet automotive and industrial safety standards."

The dsPIC33AK512MPS/MC DSCs are available starting at $1.50 each in volume. For more information, see the dsPIC33AK512MPS512 and dsPIC33AK512MC510 pages. You can purchase directly from Microchip or contact a Microchip sales representative or authorized worldwide distributor.

(a)



(b)

Figure. The latest digital signal controllers from Microchip Technology feature specialized peripherals for efficient power conversion. The devices enable the implementation of computation-intensive control algorithms for improved energy efficiency in motor control, AI server power supplies, energy storage systems and complex sensor signal processing with machine learning (ML)-based inferencing. A package photo (b) and dsPIC33AK512MPS512 and dsPIC33AK512MC510 family block diagram (b) are shown here.