

MICROCONTROLLERS

Added Arm Core Yields a More Flexible iMOTION Controller

By Maurizio Di Paolo Emilio

Manufacturers increasingly tend to consider the actual motor control unit as a basic functional block rather than a diversifying feature of the final product; this is particularly apparent for auxiliary systems such as water drainage pumps or fans normally found in domestic appliances. Infineon Technologies' new IMC300 combines the iMOTION Motion Control Engine (MCE) motor with an additional microcontroller based on the Arm Cortex-M0 core. The IMC300 portfolio targets variable-speed drives that require high application flexibility.

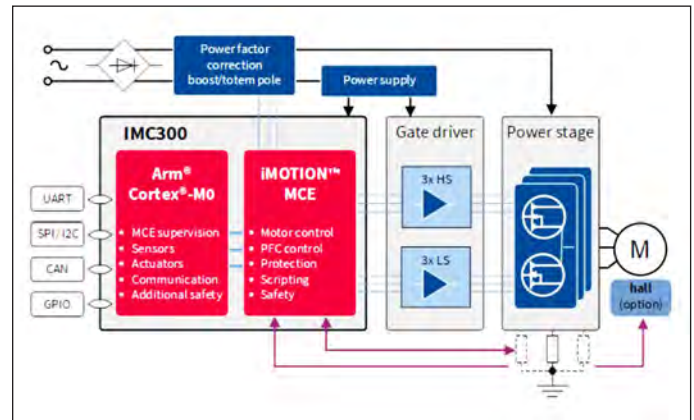
Controlling a motor's speed and direction presupposes the mode of operation of the motor in use and requires different techniques and circuits depending on the type of motor and the different application requirements. The purpose of a motor controller is to be able to act manually or automatically on the electric motor (start-stop, advance-inversion, speed, torsion, and protection against voltage overloads). Electric-motor control requires electronic circuits, which, until a few years ago, were made with discrete components because of the voltages and currents involved. Engine control today is at the forefront of R&D activities to achieve efficient microelectronic solutions on two levels: the computational software and power electronics.

iMOTION TECHNOLOGY

iMOTION identifies a family of products that integrate a ready and certified motor control algorithm with the hardware for productive use, with power factor correction (PFC) available as an option. In power electronics solutions for motor control, it is necessary to ensure flexibility and adaptability to the customer's target application, which often goes well beyond the configuration of the motor under consideration.

iMOTION ICs integrate all the control and analog interface functions required for sensor-field-oriented control (FOC) motor control using DC shunt current measurements or DC connection. In addition, they feature Infineon's patented algorithm, which eliminates software coding from the motor control algorithm development process. iMOTION solutions fit into home appliances and small drives such as fans. The solutions combine controller, SmartDrive, and SmartIPM devices.

The SmartDrive device is integrated with the gate driver (MOSFETs or IGBTs can be used). The highest integration level is achieved in the SmartIPM family, which combines the MCE with the gate driver and a



IMC300 circuit application (Image: Infineon Technologies)

three-phase full bridge, resulting in a complete inverter system in one small PQFN package.

Targeting the regulation of variable-speed motor control systems, the ICs in Infineon's iMOTION IMC300 family integrate an additional, user-programmable microcontroller. The dual-core controller integrates the required hardware, software, and user program to regulate a permanent-magnet synchronous motor (PMSM). It enables a flexible motor control system at the lowest system and development cost.

Protection features of the IMC300 include under/overvoltage, over-current, overtemperature, motor gate kill, rotor lock, fault reporting, minimum dead time, and shoot-through. Control features include sinusoidal FOC, sensed/sensorless, three- or two-phase modulation, field weakening, zero vector braking, integrated PFC, and integrated bootstrap. The IMC300 and its predecessor, the IMC100, share the same implementation of MCE 2.0, providing a ready-to-use solution with PFC control, multiple protection features, and a scripting engine.

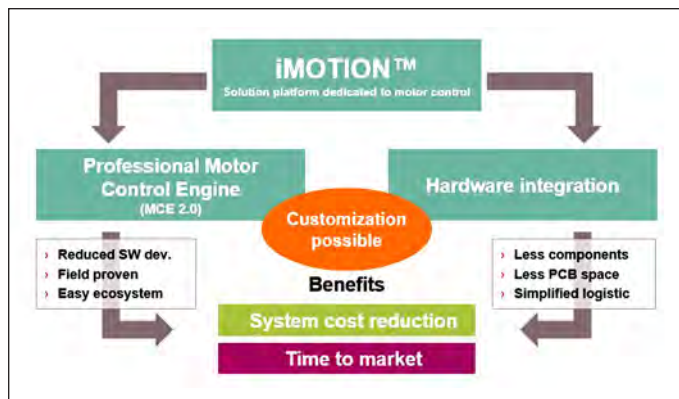
By applying MCE for motor control, customers can focus on the system application, which works completely independently on the built-in Arm microcontroller. That MCU offers a flexible set of peripherals and can serve a multitude of purposes, such as system functions, specific communication, or drive monitoring.

"The main idea behind this to make it easy for the customer to turn the motor," said Ingo Skuras, product marketing manager for iMOTION at Infineon Technologies. "We've seen a trend for some years now toward electronic control of most motors — not just on or off, but variable-speed drives, as they are called. And we do have solutions for that, which basically the customer can use without any programming: Just configure them to the respective motor uses, and then it's running. Typically, it takes half an hour to an hour to [accomplish this]."

The MCE integrates all the necessary hardware and software components, as well as all the necessary protection functions, resulting in a reduced BOM. It undergoes continuous improvements; typically, two versions are released per year.

A motor control algorithm that transfers more intelligence to peripherals such as A/D converters or timers reduces the load on the CPU core. With solutions that include small controllers integrating modern 32-bit architectures, this freed-up CPU capacity is made available to the application designer.

The IMC300 devices are pre-certified for applications requiring functional safety according to UL/IEC 60730 (Class B). ■



iMOTION drives integration in motor control.

(Image: Infineon Technologies)

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