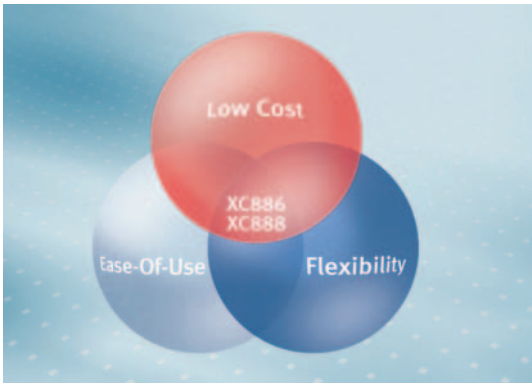
Field Oriented Control Using XC886/888 MCU

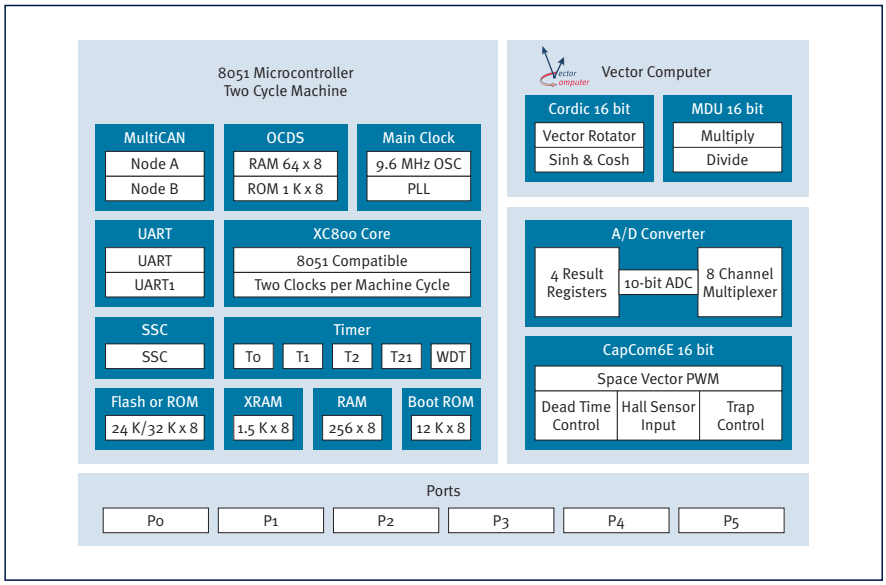


Field Oriented Control of a Permanent Magnet Motor Using a Cost Effective 8-bit µC

Field Oriented Control is increasingly being used in consumer and industrial motor control owing to the Higher Efficiency, Better Dynamic response and Lower Torque Ripple. Typically a 16 or 32-bit MCU or DSP is required to handle the complex trigonometric equations. Infineon's XC886/888 offers the full benefits of FOC at a fraction of the cost compared to DSP/DSC solution.

Compared to today's solution on the market, where FOC execution engages the whole central processing unit's (CPU) load, FOC execution on Infineon's XC886 and XC888 microcontrollers only requires 58 percent of the CPU's performance providing ample headroom for other applications. Unlike most hard-coded competitive FOC implementations, Infineon provides the additional benefit of software re-programmability adding flexibility and potential for differentiation to the application. Field Oriented Control implemented on an 8-bit MCU is the perfect answer to energy related regulations and pricing pressure for appliance manufacturers.

XC886/888 Block Diagram



Key Features of XC886/888 which enables Field Oriented Control

- High performance 16-bit vector computer (CORDIC + MDU)
  - Fully programmable co-processor
  - Key functions
    - Vector rotation and transformations like Park transform
    - Normalizing and scaling
  - Interrupt based operation with minimum CPU load
- PWM unit for advanced motor control (CapCom6E)
  - 16-bit resolution for high precision space vector PWM generation
  - Dead time control for minimum hardware effort (direct control of MOSFET/IGBT)
  - CTRAP provides hardware overload protection
- A fast 10-bit A/D Converter (conversion time of less than 1.5 µs)
  - Enables single shunt current measurement
  - Reduced torque ripple due to minimized blind angle
  - Hardware synchronization to PWM unit reduce CPU load
  - Two result registers to maximize sampling performance

Applications

- Home appliances
- Industrial and automotive motor control

For more information please visit www.infineon.com/XC886

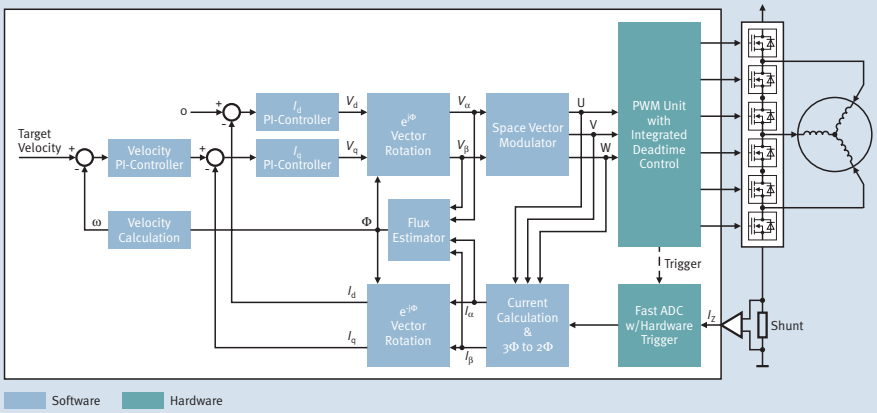
www.infineon.com/microcontrollers

Microcontrollers

Never stop thinking

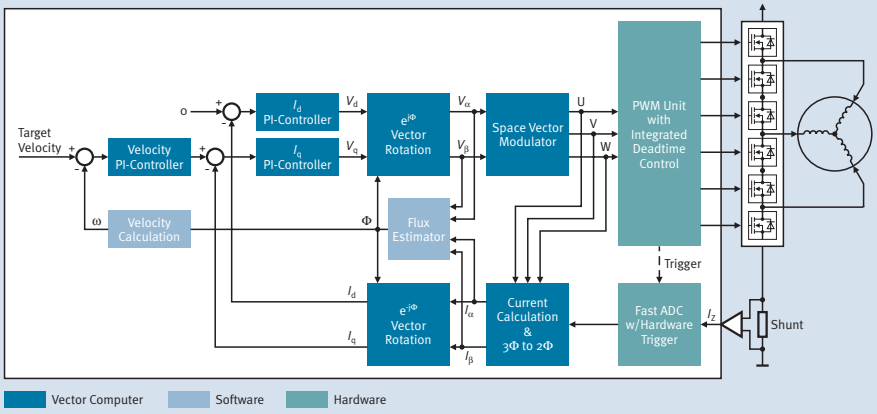
Implementation of Field Oriented Control

Traditional Implementation of Field Oriented Control



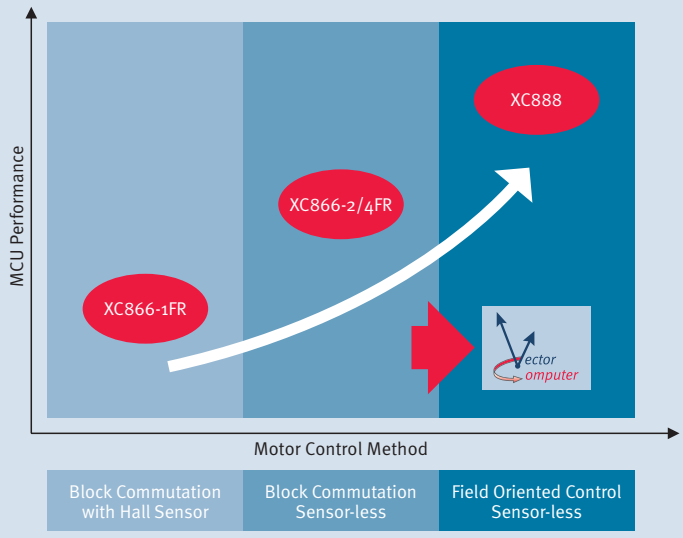
- Software based calculations demands a high performance MCU (16/32-bit MCU or DSP)
  - High system cost
  - Complex software development

XC886/888 Based Implementation of Field Oriented Control



- In-built vector computer boosts computing performance
  - 8-bit MCU able to implement FOC with only 58% CPU load
- 8051 based solution offers significant advantages
  - Lower system cost
  - Ease-of-use

Infineon's XC800 8-bit Family Offers the Scalability Required for a Wide Range of Motor Control Applications



- Scalable MCU solutions
- XC866 series offers a cost-effective solution for Block Commutation Motor Drive
- XC886/888 series offers the performance boost required for Sensor-less Field Oriented Control

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