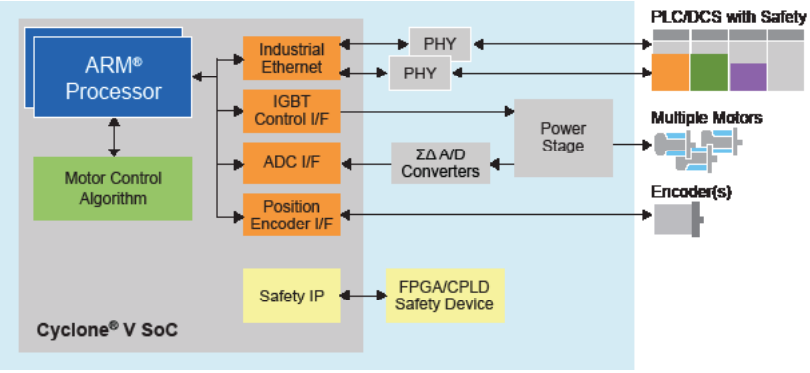
Lower Cost, Higher Performance, and Faster Design

Industrial Motor Drive on a Single SoC FPGA

Drives and motors are an integral part of industrial equipment from packaging, robotics, computer numerical control (CNC), machine tools, industrial pumps, and fans. Designing next-generation drive systems to lower operating costs requires complex control algorithms at very low latencies as well as a flexible platform to support changing needs and the ability to design multiple-axis systems.

Traditional drive systems based on ASICs, digital signal processors (DSPs), and microcontroller units lack the performance and flexibility to address these needs. Altera's family of SoC FPGAs integrates an ARM-based processor subsystem with an FPGA on a single monolithic device (Figure 1). Our SoC FPGAs feature industry-leading variable-precision DSP blocks and provide the ideal "drive-on-a-chip" platform for DSP processing, Industrial Ethernet, functional safety, and I/O expansion.

Figure 1: "Drive on a Chip": Cyclone V SoC FPGAs Include ARM Processor, Motor Control Algorithm, I/O Logic, Industrial Ethernet Protocols, and Safety Elements



Lower Costs Through Design Integration

- Reduce total cost of ownership with our drive-on-a-chip system:
  - Combines a Cyclone® V FPGA with a high-performance, dual-core ARM® processor subsystem, allowing you to tightly couple the processor subsystem with hardware accelerators for motor control
  - Extend functionality by integrating industrial networking, encoder interfaces, I/O, analog interfaces, and logic
- Save board space and reduce power consumption with fewer required components and the ability to support multi-axis control
- Adapt quickly to changing market requirements with less design work through our support for leading industrial Ethernet protocols and I/O standards

Reduce Time To Market

- Save development time and lower risk for designing product variants by reusing intellectual property (IP) cores and leveraging the ARM ecosystem
- Reduce your safety certification time by up to 24 months with our TÜV Rheinland-qualified IEC 61508 Functional Safety FPGA data package

Meeting Higher-Performance Drive Requirements

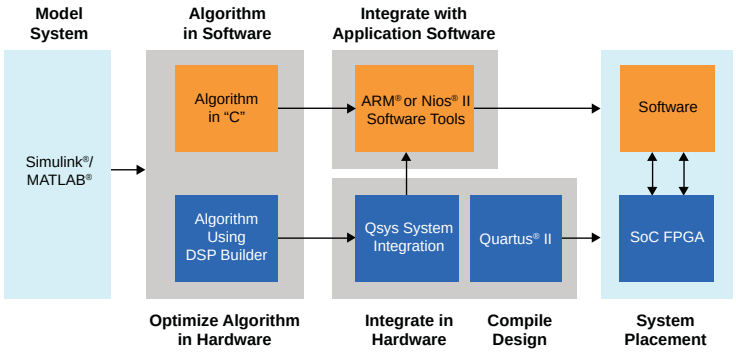
- Implement control-loop algorithm latencies of less than 5 µs using our variable-precision DSP blocks, multipliers, support for floating point, and arithmetic DSP functions
- Optimize your design by partitioning between software and hardware elements using our model-based design methodology with system-level design tools

System-Level Design Flow Tailored for DSP Performance

To optimize your motor control algorithms and designs, you will need versatile tools and a practical design methodology. Figure 2 shows a tool flow that helps model and simulate the system, implement complex algorithms with low latency, integrate the hardware/software system, and fine-tune the performance to the exact needs of the motor drive.

You also can take advantage of easy-to-use development tools, such as Quartus® II design software, and system integration tools, such as Qsys and DSP Builder for DSP optimization. With support for model-based environments such as Simulink®/MATLAB® to model the algorithm, you can integrate a motor control system directly to the DSP Builder tool for the most optimized drive designs. What's more, you can use the familiar tool flow and resources of the rich ARM ecosystem to reduce development time and take advantage of legacy code.

Figure 2: System-Level Optimized Design Flow for an SoC FPGA Drive System



Altera SoC FPGA Portfolio

Our SoC FPGAs join a diverse family of 28-nm Cyclone V FPGAs that are tailored to your design requirements. Cyclone V FPGAs provide the industry's lowest system cost and power, along with multiport memory support such as DDR3/LPDDR, integrated transceiver options, variable-precision DSP blocks, and performance levels that make the device family ideal for differentiating your high-volume applications. You'll also get up to 40 percent lower total power versus the previous generation and efficient logic integration capabilities.

Want to Dig Deeper?

For more information about Altera's SoC FPGAs for motor control applications, contact your local Altera sales representative or FAE, or visit **www.altera.com/industrial**.

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