*Technical Article*

# *Industrial Drive Control Architectures: Part 3*

Texas Instruments

Brian Fortman

In the previous posts of this blog series, we investigated how FPGAs were introduced into drives architectures as well as the challenges that FPGAs can bring in our second post. In this part we will give an overview of many key functions that can now be performed by a C2000™ Delfino™ MCU, like the F28379 MCU, and therefore reduce or eliminate the need for an FPGA in these systems.

Many industrial inverter and servo drive manufacturers have traditionally relied upon field-programmable gate-array (FPGA) or ASIC technology to complete functions that are not supported by commercial, off-the-shelf (COTS) products, like 32-bit microcontrollers (MCUs). However, adding FPGAs and ASICs to software programmable controllers, in order to support position sensor feedback or sigma-delta filtering, as examples, will increase system cost and add development complexity.

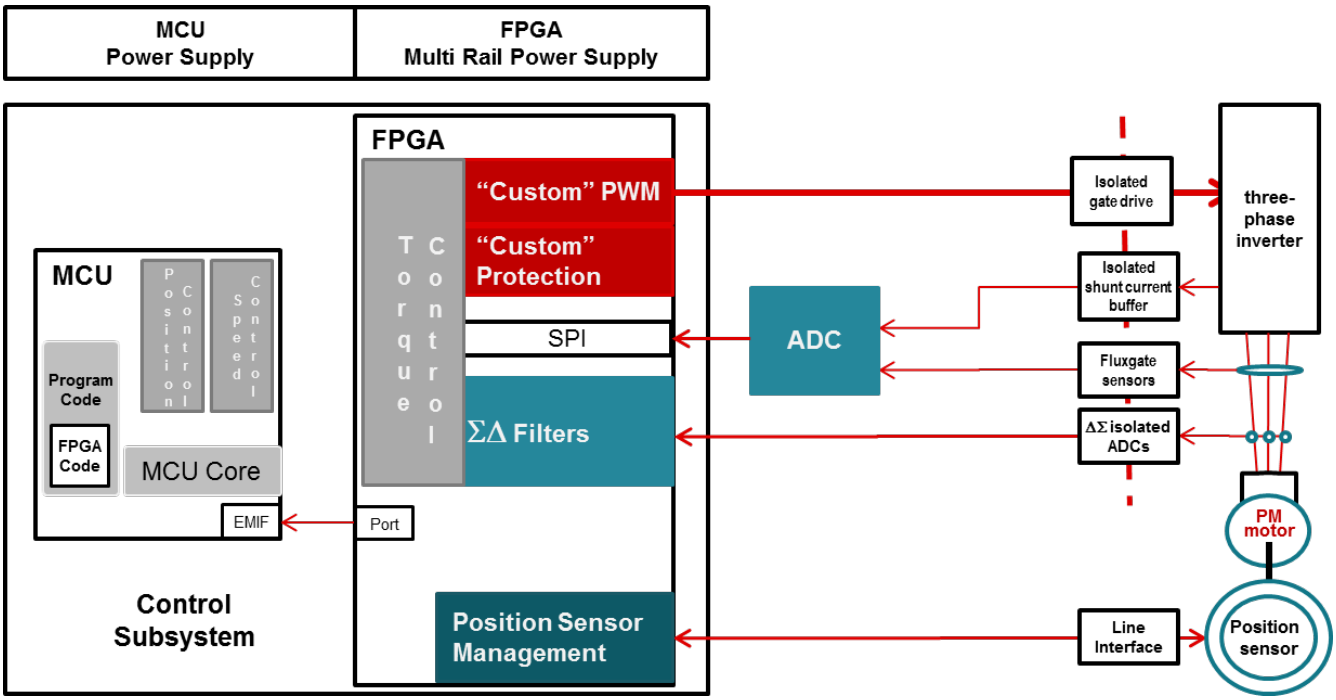


**Figure 1. Industrial drive system, MCU + FPGA**

The Delfino MCU portfolio has the ability to achieve a two and one-half microsecond floating-point torque-loop calculation and contains highly flexible 150ps high-resolution PWMs. The CLA real-time coprocessor is a great target for these algorithms to minimize the period between the sample and the next PWM command. Up to eight channels of integrated sigma-delta filters are also on-chip and include parallel under/over-range comparators on the same channel. The on-chip comparator subsystem and PWM trip-zone capabilities can invoke a safe PWM state (off) in 50 ns! Delfino MCUs are highly flexible when generating on-chip conditions for triggering a trip-zone event. Many different types of PWM protection concepts can be implemented using these on-chip resources and thus eliminating the need to place the circuits in external FPGAs. See Figure 2 for a drives system overview.

In addition, the new Delfino TMS320F28379S and TMS320F28379D MCUs and the DesignDRIVE Position Manager technology are the latest additions to the Delfino MCU family. Combining the DesignDRIVE Position Manager software with the new Delfino F28379 MCUs, the on-chip functions mentioned above are expanded to allow for easy and direct connections to EnDat2.2 and BiSS-C absolute position sensors – features that required

FPGAs in the past. What's more, by using some of the sophisticated analog circuits on-chip, these same devices are capable of decoding resolver signals as well as angles from SIN/COS transducers.

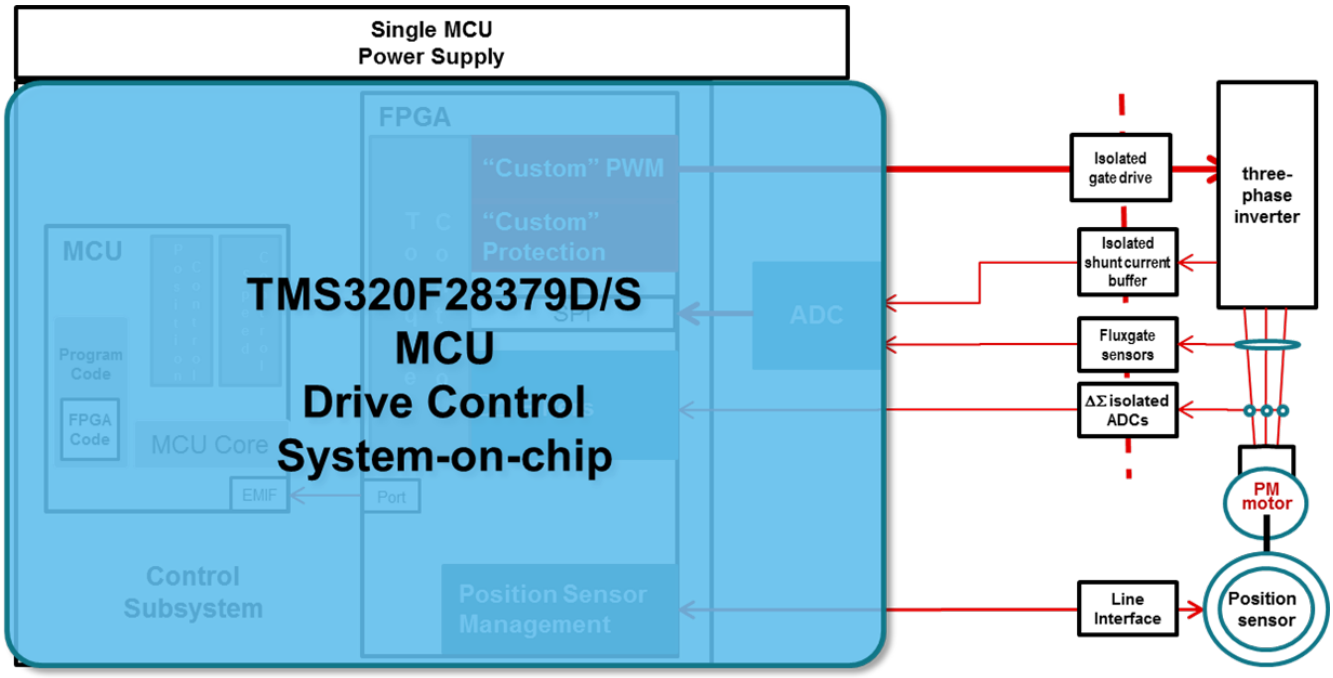


**Figure 2. Industrial drive control SoC-- C2000 TMS320F28379 MCU**

This solution is the first of its kind to offer the breadth of position sensor support, flexibility, scalability and robustness, which allows developers to decrease system cost by reducing the board area of the FPGA or ASIC.


**Figure 3. Leading analog and digital position sensors supported**

The C2000 MCU DesignDRIVE technology offers on-chip solutions for industrial drives, integrated into COTS real-time MCUs. DesignDRIVE solutions simplify the system, saving board space and development effort, which frees developers from making unnecessary investments in features that are non-differentiating in the industry. Instead, developers can focus on product differentiation as well as core competencies, like motor control and motion control, and not on building FPGAs or writing the complex code needed to complete non-differentiating tasks.

Start investigating DesignDRIVE Position Manager technology and a range of industrial drive design topologies today with TI's DesignDRIVE Kits (TMDXIDDK379D or TMDXIDDK379D-MTR-BNDL). The kits are available from the TI Store or any authorized TI distributor.

DesignDRIVE Position Manager  technology will help you get a compelling industrial inverter or servo drive product to market quickly. For more information on Position Manager, DesignDRIVE, C2000 real-time MCUs or other TI solutions for industrial drives please visit www.ti.com/c2000 and www.ti.com/tool/designdrive.

**Read More:**

- Industrial drive control architectures: Part 1
- Industrial drive control architectures: Part 2

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265