Designing of Next Generation Motor Drive Control for Electric Vehicle Application

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Abstract

Due to the staggering levels of pollution around the world today from gasoline vehicles, the research and production of efficient and eco-friendly electrified vehicles (EVs) is a necessary goal to pursue. As the core of electric vehicle application, electric motor drives act an important role to convert the electrical energy into mechanical energy and provide electrical control of the processes. Therefore, it is required for researchers to make it extremely energy-efficient and have bi-directional power flow capability to ensure the improvement of motor performance and be flexible regarding controllability by maintaining reduced volume and weight, with minimal stress on the EV battery pack and the motor. The goal of the author is to investigate the operation of motor drive and combine the programming of the microcontroller to achieve control of electric motor. Previously, work was done on generating a printed circuit board (PCB) which would act as the motor drive board and would house all the necessary components needed to control the motor. Currently, work is being done to learn the C programming language to develop programs in Code Composer Studio that explore the different ways to use a Digital Signal Processor - which is what controls the motor - such as the TI F28335 board. Within this learning process, a multitude of concepts are explored: understanding how registers and interrupts work, how to utilize peripheral units such as digital input/output, how to produce waves of varying frequencies, duty cycles and periods, and how to use these to generate pulse width modulation (PWM) signals which are often used to control motors. Once these basics are established, work will be done with existing and new inverters to control permanent magnet synchronous motors (PMSM). As a work in progress, the ultimate goal is to be able to establish motor control with the programs developed and have a solid understanding of how to change the code to adjust different aspects of the motor.

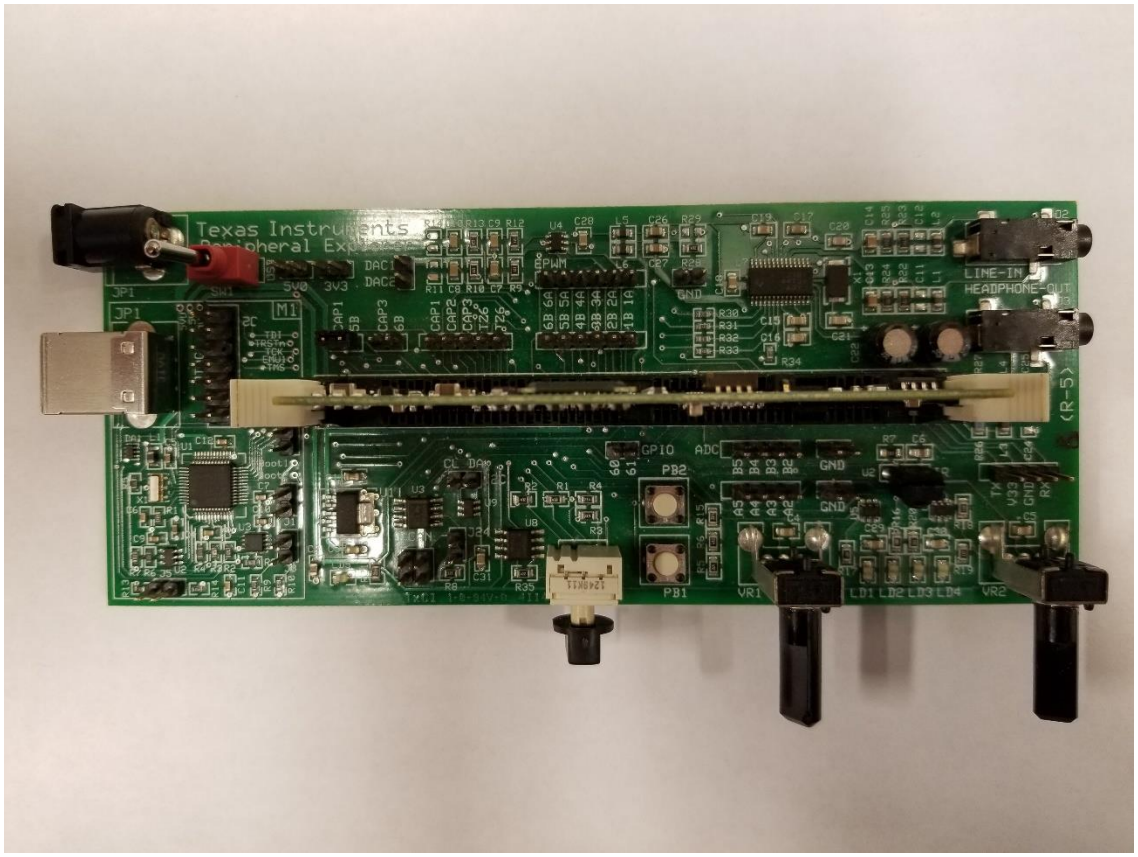

Figure 1: Current evaluation board being used to understand microcontroller programming

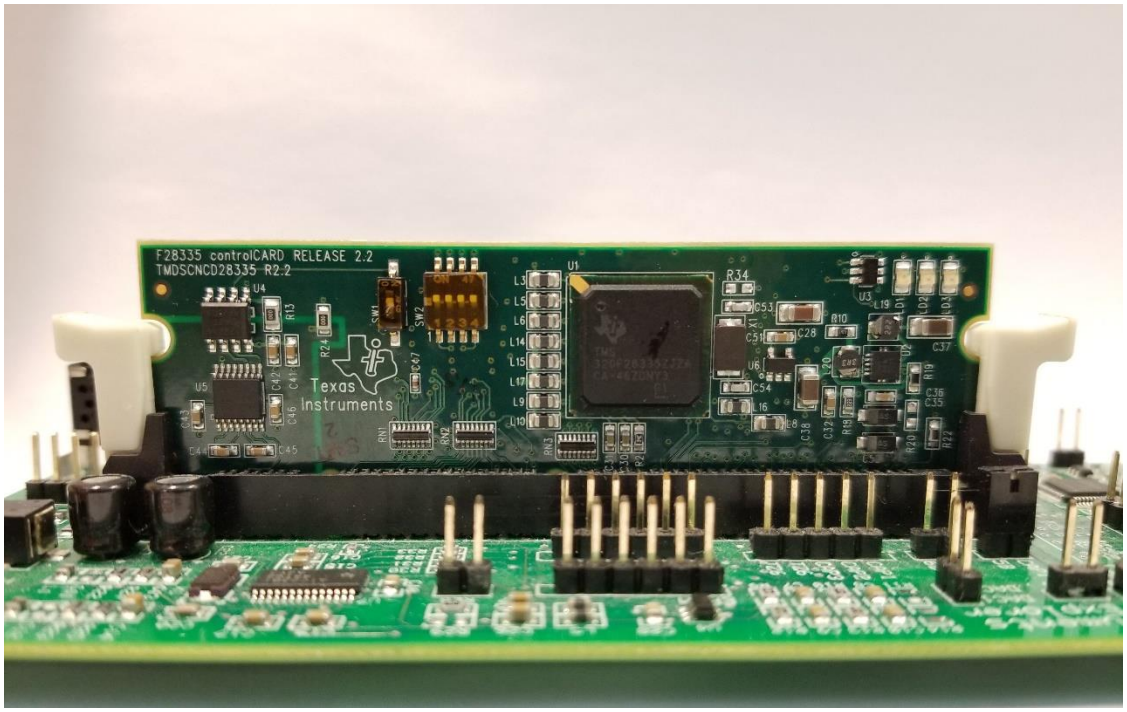

Figure 2: View of the microcontroller on the evaluation board