TM4C123x Stepper Motor Control

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ABSTRACT

Stepper motors are ubiquitous. The motor itself is relatively low cost and the electronics necessary to drive and control it are relatively simple. The main advantage of stepper motors is that they can provide open-loop position control for a fraction of the cost. They are used in a wide range of applications from robots, printers, industrial position control, projectors, cameras, computer peripherals, machine tools, medical equipment, automotive devices, and small business machines.

Contents

1   Introduction

Stepper Motor Systems typically consist of three components:

• Controller: A microcontroller capable of generating the proper signals to control the motor.

• Driver: Converts the signals from the controller to the necessary voltage and current required to accurately and efficiently drive the motor.

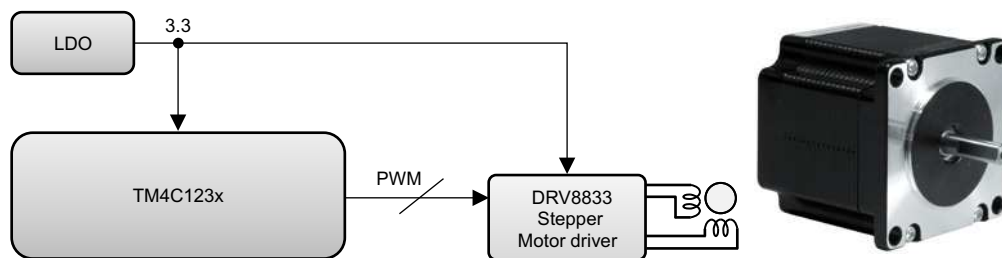• Stepper motor: Electromagnetic device that converts the drive signals to rotational movement.

Figure 1. Stepper Motor Drive: System Block Diagram

2   TM4C123x

The TM4C123x features deterministic performance and IP especially designed for simultaneous advanced motion control and real-time connectivity. The TM4C123x Series MCUs integrate the ARM® Cortex®-M4 CPU with single-precision floating-point core operating up to 80 MHz and high-performance analog-to-digital converters (ADC) while still providing low-power modes that consume as little 1.6 µA. With up to 40 pulse width modulator (PWM) outputs, a generous number of serial communication peripherals, universal serial bus (USB) v2.0 on the go (OTG), and two controller area network (CAN) controllers, the TM4C123x series provides an excellent baseline for stepper motor applications.

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3 DRV8833

TI's DRV8x family offers a rich family of stepper motor driver solutions with advanced current control and microstepping schemes to deliver precise, smooth motion profiles and reduced acoustic noise. The DRV8833 device has two H-bridge drivers to drive a bipolar stepper motor, two DC brush motors, or other inductive loads. Aimed at driving 3.3 V and 5 V motors, this stepper driver with integrated FETs support up to 1.5A (rms) with a low-power sleep mode to conserve power for battery-powered applications. Internal shutdown functions with a fault output pin are provided for overcurrent protection, short-circuit protection, undervoltage lockout, and over temperature.

4 Getting Started

- Stepper Motor Overview
- TM4C123x Launchpad
- DRV8833 EVM and example software
- WebBench

5 Low Drop Out (LDO) Regulators

LP2985 is a family of fixed-output, low-dropout regulators.

LM1117-N is a series of low dropout voltage regulators with a dropout of 1.2 V at 800 mA of load current.

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