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 ................................................................. 1
2 TM4C123x ........................................................................ 1
3 DRV8833 ...................................................................... 2
4 Getting Started ........................................................... 2
5 Low Drop Out (LDO) Regulators .......................................... 2

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](image-url)

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.
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.
IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have not been so designated is solely at the Buyer’s risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

| Audio       | www.ti.com/audio             | Applications      | Automotive and Transportation | www.ti.com/automotive             |
| Amplifiers  | amplifier.ti.com             |                   | Communications and Telecom    | www.ti.com/communications         |
| DSP         | dsp.ti.com                   |                   | Energy and Lighting           | www.ti.com/energy                 |
| Interface   | interface.ti.com            |                   | Medical                       | www.ti.com/medical                |
| Logic       | logic.ti.com                 |                   | Security                      | www.ti.com/security               |
| Power Mgmt  | power.ti.com                 |                   | Space, Avionics and Defense   | www.ti.com/space-avionics-defense |
| Microcontrollers | microcontroller.ti.com     |                   | Video and Imaging             | www.ti.com/video                  |
| RFID        | www.ti-rfid.com              |                   |                              |                                   |
| OMAP Applications Processors | www.ti.com/omap      | TI E2E Community  | e2e.ti.com                    |
| Wireless Connectivity | www.ti.com/wirelessconnectivity |               |                               |                                   |

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2015, Texas Instruments Incorporated