

Automotive Adaptive Front Light Positioning Stepper Motor



System Description

This TI reference design provides an integrated motor driver solution intended to drive a bipolar stepper motor in an automotive adaptive front light positioning application. This design features off battery capabilities with 45V maximum operating supply voltage along with internal shutdown functions provided for overcurrent protection, short circuit protection, under voltage lockout, and over temperature.

Featured Applications

- Automotive Adaptive Front Light Positioning

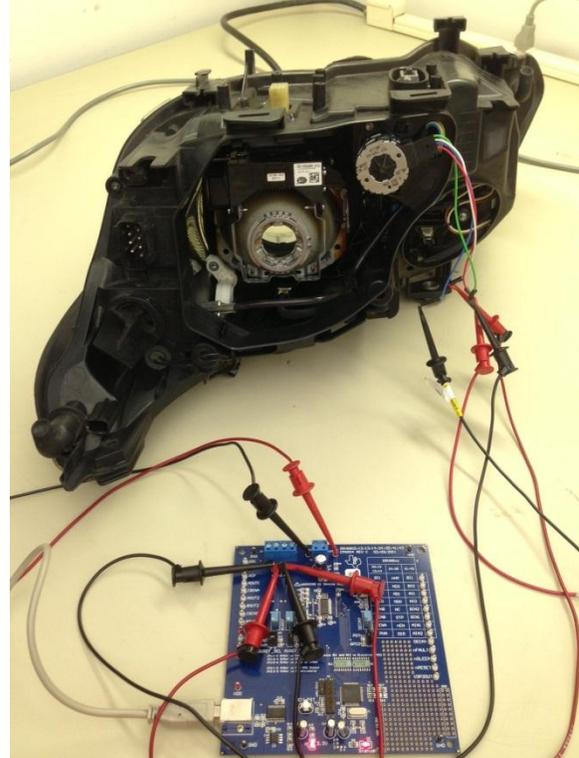
Design Resources

- Block Diagram and Schematic
- Test Data
- Gerber Files
- Design Files
- Bill of Materials
- Wiki Page

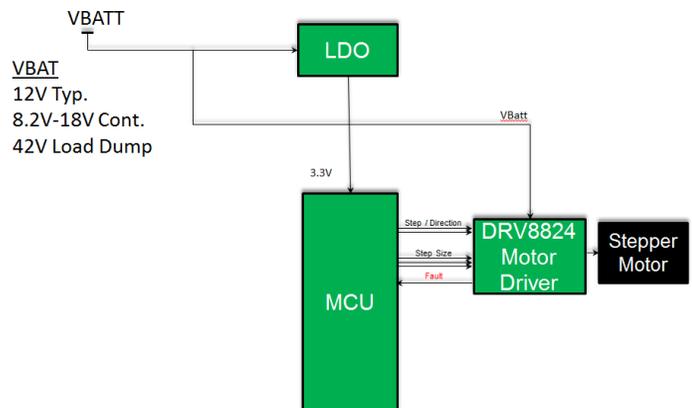
Design Features

- Wide Vin (42V Load dump capable)
- 1/32 Microstepping built in indexer (smooth quiet motion)
- DRV8824 On-chip protection enables higher system reliability
- VM sleep mode minimizes power consumption (battery drain)

Design Photo



Block Diagram



Jump start system design and speed time to market

Comprehensive designs include schematics or block diagrams, BOMs, design files and test reports by experts with deep system and product knowledge. Designs span TI's portfolio of analog, embedded processor and connectivity products and supports a board range of applications including industrial, automotive, medical, consumer, and more. To explore the designs, go to <http://www.ti.com/tidesigns>

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Associated Part Numbers

<u>Part Number</u>	<u>Part Description</u>	<u>EVM Link</u>
DRV8824-Q1	1.6A Bipolar Stepper Motor Driver w/ Microstepping Indexer	EVM
MSP430F1612	16-bit Ultra Low Power MCU	
TPS77701	Automotive 3-Pin Supply Voltage Supervisor	

Design Considerations:

- Wide Vin range devices were selected for this system since they are suitable for automotive applications in their ability to withstand load dump conditions.
- The DRV8824 has two H-bridge drivers, a micro-stepping indexer, and is intended to drive bipolar stepper motors found in automotive applications such as adaptive headlights.
- The advanced on-chip protection of the DRV8824 reduces design complexity and enables higher system reliability.
- The DRV8824's sleep function minimizes power consumption off of the car battery.
- Simple step/direction control handled by the on-board MSP430 allows easy interfacing to controller circuits. Pins allow configuration of the motor in full-step up to 1/32-step modes. The decay mode is also programmable. (For automotive qualified MCU, the MSP430G2553 is planned for qualification)
- We are utilizing an LDO that can be powered directly off of the car battery to supply the MCU and other logic circuitry. (For automotive qualified LDO, we recommend the TPS7A6633-Q1)

Quick Start Guide

Getting Started: What's Needed

- DRV8824EVM
- Automotive AFS Bipolar Stepper Motor
- Power Supply (voltage and current determined by datasheet recommended parameters and bipolar stepper motor ratings)

Configuration

- Use the default jumper configuration (microcontroller resources utilized) specified in EVM User's Guide
- Connect the bipolar stepper motor to the EVM using either the four pin header (J4) or the four position terminal block (J3)
- Install EVM driver and software according to EVM User's Guide instructions

Operation

- Connect PC to EVM through USB interface
- Run the application and setup the GUI according to EVM User's Guide instructions
- Configure all GUI control signals based on preferred mode of operation
- Apply VM (Motor Voltage) via the terminal block (J1) according to datasheet recommended parameters and bipolar stepper motor ratings
- The bipolar stepper motor is ready to be turned using GUI control signals



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