TI Designs

Automotive Brushed Motor Drive for Power-Folding Side Mirrors Reference Design

Description

This TI Design features the DRV8801EVM and the DRV8872EVM. These evaluation modules (EVMs) enable an easy-to-use platform to demonstrate the capability and performance of the DRV8801 and DRV8872 motor drivers for power-folding side mirrors. This TI Design also intends to allow easy evaluation of the automotive qualified versions of the DRV8801 and DRV8872 (DRV8801-Q1 and DRV8872-Q1). The DRV8801-Q1 is a 2.8-A peak, full-bridge, brushed DC motor driver capable of driving the retracting function of vehicle side view mirrors. With the built-in automotive protection features of overcurrent, thermal, shoot-through, UVLO, and wide-input voltage (wide V_{IN}) range, this motor driver provides the necessary features to survive a harsh automotive environment. Additionally, this TI Design provides test data to allow the designer to quickly evaluate the performance of the DRV8801-Q1 and the DRV8872-Q1 for their folding-mirror modules.

Resources

TIDA-00145	Design Folder
DRV8801	Product Folder
DRV8801-Q1	Product Folder
DRV8872	Product Folder
DRV8872-Q1	Product Folder
TPS77701	Product Folder
MSP430F1612	Product Folder

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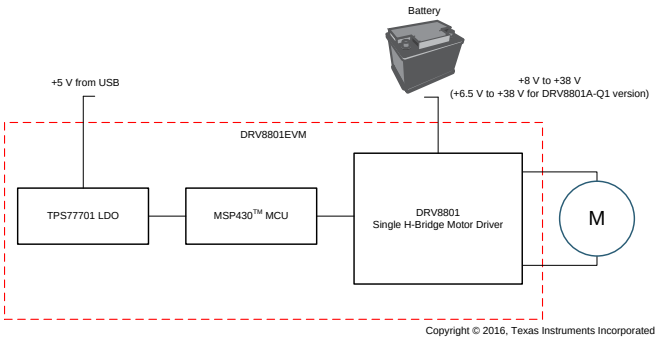
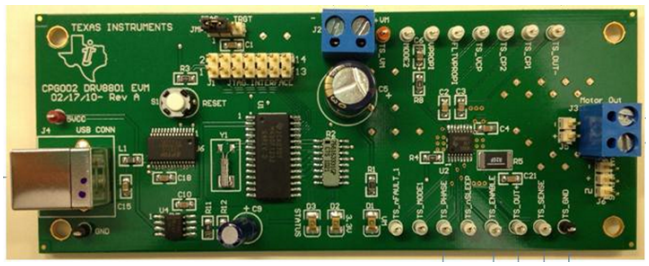
Features

- Single H-Bridge Motor Driver With Integrated Protection Features of Overcurrent, Thermal, and Undervoltage Lockout for Higher System Reliability Overvoltage Protection: 45 V
- Wide 8-V to 36-V Input Supply Range Easily Supports +12-V and +24-V Industry Standard Supplies
- High 2.8-A Peak Current Helps Support Large Startup and Stall Inrush Currents
- EVM includes easy to use GUI
- Phase and Enable Control Interface Provides Simple, 2-pin Control Interface for Motor Operation
- Brake Mode Support Allows the Motor to Stop Quickly
- Available AEC-Q100 Device Options for EVM ICs

Applications

- Automotive Body and Convenience Electronics
- Car Side-View Mirrors
- Grill Shutters





1 System Overview

1.1 Block Diagram

Figure 1 shows the DRV8801 block diagram, and Figure 2 shows the DRV8872 block diagram.

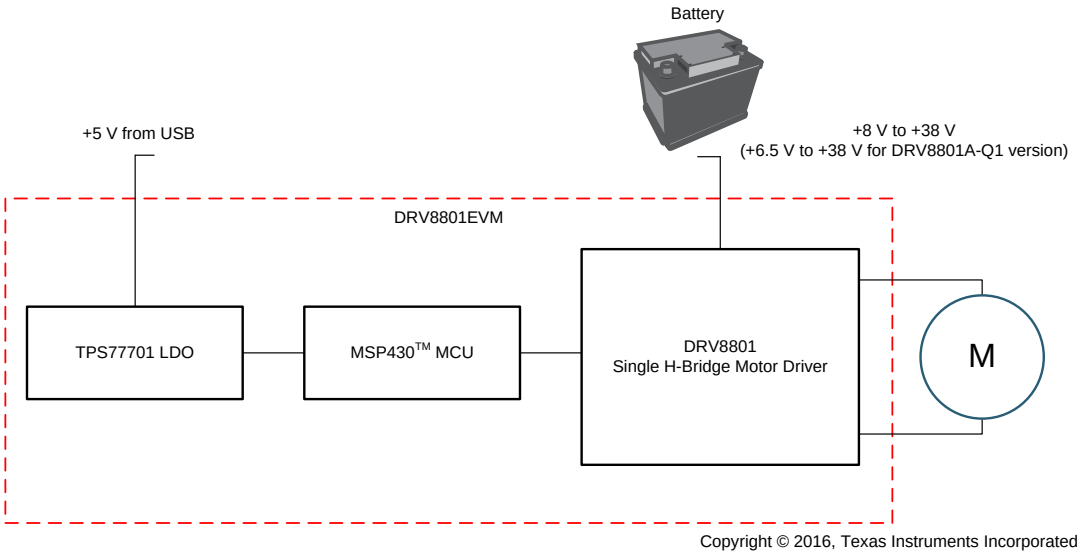


Figure 1. DRV8801 Block Diagram

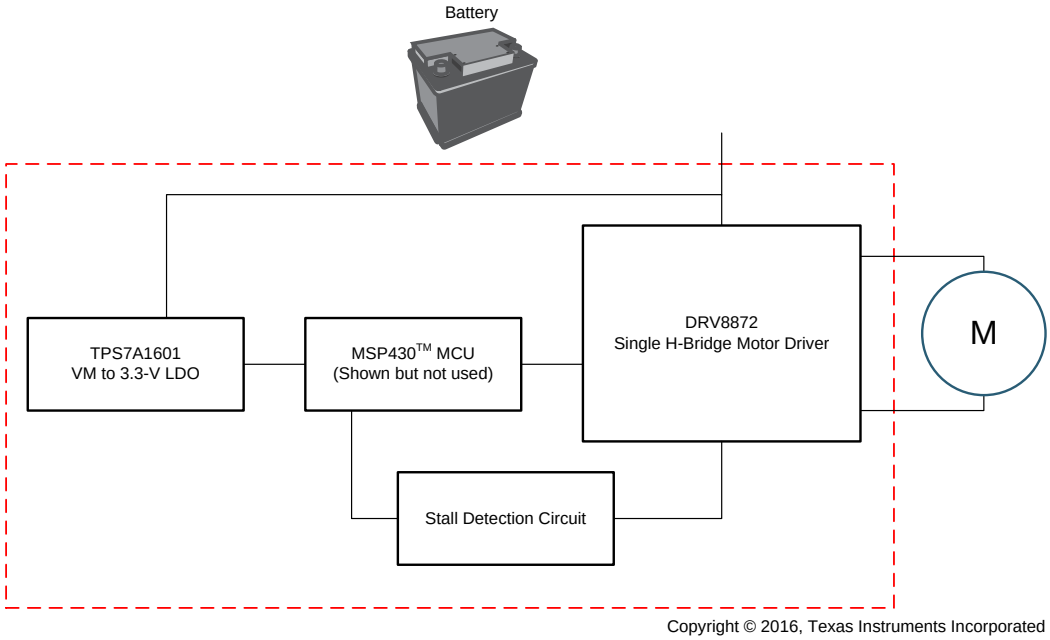


Figure 2. DRV8872 Block Diagram

1.2 DRV8801EVM Quick Start Guide

Use the following instructions for test setup.

1. Install the EVM graphics user interface (GUI), then connect the PC to the DRV8801EVM using USB CONN (J4).
2. Connect the 12-V power supply and ground to the DRV8801EVM through +VM and –VM, respectively (J2).
3. Connect the motor leads to the DRV8801EVM through Motor Out (J3).
4. Connect the TS_PHASE and TS_ENABLE pins to the 3.3-V power supplies.

   The firmware and GUI (as is) only support pulse width modulation (PWM) control, so connecting the pins to a logic supply can simplify the testing to provide 100% duty cycle signals.
5. Connect the scope leads to the DRV8801EVM at TS_OUT+ and TS_OUT–.
6. Connect the scope and current probe to the DRV8801 through TS_SENSE.

1.3 DRV8872EVM Quick Start Guide

Use the following instructions for test setup.

1. Create a stall detection circuit (see TIDR549).
2. Connect the 12-V power supply and ground to the DRV8872EVM through VM and GND, respectively.
3. Connect the motor leads to the DRV8872EVM through OUT1 and OUT2.
4. Connect the scope leads to the DRV8872EVM at OUT1, OUT2, and nSTALL.
5. Connect the scope and current probe to the DRV8872 through OUT1.
6. Control the forward or reverse direction by connecting IN1 or IN2 to V5P0.

1.4 Design Considerations

Linear Regulator: The EVM uses the TPS77071 LDO to power the MCU, but the designer may also consider the TPS7A66xx and TPS7A69xx LDOs from TI's automotive high-voltage LDO portfolio. LDOs in the TPS7A66xx and TPS7A69xx part families feature a low 12-µA quiescent current and short-circuit and overcurrent protection.

MCU: The motor operation through the motor driver interface of the 2-pin control is managed by the onboard MSP430™. TI has automotive qualified MSP320 devices, and TI recommends the MSP320F2272-Q1 for this design.

Motor: Because most motor-driven automotive convenience features do not require highly efficient motors and cost is typically more of a concern, a brushed motor was selected for the wing-mirror folding function.

Motor Driver, DRV8801: The DRV8801 is a single H-bridge, integrated motor driver with protection features and can handle the necessary current to fold a mirror. Also, while the DRV8801 onboard the EVM is not automotive qualified, TI has an automotive qualified version (DRV8801-Q1) available. The automotive version supports the same features and functionality.

Motor Driver, DRV8872: The DRV8872 is a single H-bridge, integrated motor driver with protection features and can handle the necessary current to fold a mirror. Also, while the DRV8872 onboard the EVM is not automotive qualified, TI has an automotive qualified version (DRV8872-Q1) available. The automotive version supports the same features and functionality.

2 Design Files

2.1 Schematics

To download the schematics, see the design files at TIDA-00145.

2.2 Bill of Materials

To download the bill of materials (BOM), see the design files at TIDA-00145.

2.3 PCB Layout Recommendations

2.3.1 Layout Prints

To download the layer plots, see the design files at TIDA-00145.

2.4 Altium Project

To download the Altium project files, see the design files at TIDA-00145.

2.5 Gerber Files

To download the Gerber files, see the design files at TIDA-00145.

2.6 Assembly Drawings

To download the assembly drawings, see the design files at TIDA-00145.

3 Software Files

To download the software files, see the design files at TIDA-00145.

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (April 2014) to A Revision	Page
• Updated Resources	1
• Added Section 1.3	3

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