Technical Article

Three Ways Our Automotive Body Motors Help You Stay Ahead of Trends in Autonomous Driving and Electric Vehicles

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You order a taxi through an app on your phone, and it arrives within minutes. There's no one in the car and the doors open automatically, as you approach. You lower yourself onto the plush leather seats. The seat position and interior lighting are pre-set based on your preferences. The morning news is streaming on a sleek screen. The car goes into gear and maneuvers effortlessly through the morning traffic while you relax or check your email. About half of the cars around you are also empty. You ask the taxi what time you'll arrive. "Your estimated time of arrival is 8:30 a.m. There are no expected delays today."

This could be reality within a decade. As autonomous vehicles become more ubiquitous, passengers will also expect other features of the car to operate autonomously.

Today's new cars can include more than 30 body motors used in applications ranging from window regulators, mirrors and adjustable car seats to sunroofs, lights and air-conditioning systems. These systems of comfort and necessity will become increasingly automated and programmed according to the passenger's preferences.

The following are three ways TI can help you stay ahead of the trends and drive these innovations in automotive body motors:

1) Easily Integrate Body Motor Drivers.

With the help of our body motor drivers, design engineers are able to shorten their development times. For instance, with slew rate control, motors can be integrated more quickly. You can choose between digital or analog interfaces. Three pulse width modulation (PWM) inputs can typically be used with three-phase motors. However, with our brushless DC (BLDC) driver, it is possible to spin the same motor with only one PWM input and leave the control and synchronization of the other two phases to the driver.

2) Reduce Unnecessary Components and Cut Your Carbon Footprint.

You can avoid purchasing unnecessary external components since they are already integrated into our body motor gate driver. For instance, our smart gate drive technology allows systems to be more robust, efficient and flexible because it intelligently prevents dV/dt turn-on, limits the gate drive strength, and optimizes dead times. By having more functions integrated into a single device, this also means you can save design space in the vehicle.

For example, you may be able to reduce the height of a car's roof from 18 cm to 15 cm by replacing the relay for the sunroof. The impact of this alone would reduce the carbon footprint and enable a longer life for electric vehicles. In combination with DC motors powered by battery instead of by the drive belt of a combustion engine, auxiliary functions such as the water pump, starter generator and air conditioning can be turned on as needed, allowing a car to become more regulated and efficient.

Currently, electric cars have one large central motor in the powertrain. In the future, however, an electric motor will be integrated into each wheel (e-wheel drive), which means you can directly brake with the motor in the wheel or drive each wheel separately. This eliminates the need for differential gears, but preserves the functionality a sophisticated stability system or four-wheel drive system delivers today. The result will be a car with less weight, but also added agility and safety.

3) Enable Safer Driving.

Passenger safety is also an important design requirement and obligation. Using automotive body motors, design engineers can provide anti-pinch detection, which helps monitor and correct obstruction situations -- whether a child's arm or cargo -- the window express-up function will reverse upon detecting movement in the way of a window, tailgate or sunroof.

In the case of autonomous taxis -- which are being tested by multiple vendors at level 4 autonomy, driving on public roads with no one at the wheel to take over -- the car itself, which also has no steering wheel, accelerator or braking pedal is then responsible to coordinate entry and exit of passengers as intended. This requires a motor that closes and opens doors and ensures the doors are locked when driving.

Innovate

Above all, TI offers you flexibility to innovate. Our portfolio, with motor drive features such as smart gate drive and slew rate control, serves as a toolkit which enables you to adapt designs to meet your unique circumstances and needs.

TI's automotive body motors portfolio can help address your automotive design challenges.

Additional Resources:

- How many electric motors are in your car?
- Why are you still driving automotive motors with relays?
- Integrated intelligence part 1: EMI management
- Small-Footprint Sunroof Motor Module Reference Design
- DRV10983-Q1 BLDC motor driver EVM quick start-up
- Relay Replacement for Brushed DC Motor Drive in Automotive Applications

See TI Reference Designs:

- Automotive Brushed-Motor Ripple Counter Reference Design for Sensorless Position Measurement
- Small-Footprint Sunroof Motor Module Reference Design

- Automotive HVAC Multiple Flap Actuator/Damper DC Motor Driver-Reference Design
- Automotive 2-Axis Power Seat Brushed DC Motor Drive Reference Design

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